TS1581
C6
1949

Clark's WEAVE ROOM CALCULATIONS

THIRD EDITION

Published By
CLARK PUBLISHING COMPANY
CHARLOTTE, N. C.

LIBRARY

SOUTHEASTERN MASSACHUSETTS UNIVERSITY
· UNITATE · 1895 · FORTIOR ·

Digitized by the Internet Archive
in 2010 with funding from
Boston Library Consortium Member Libraries

http://www.archive.org/details/weaveroomcalcula00clar

Clark's
Weave Room Calculations

A practical treatise of cotton yarn and cloth calculations for the weave room, especially applicable to Southern mills

THIRD EDITION

Price: $5.00

By
W. A. GRAHAM CLARK
Former Chief, Textile Division, U. S. Tariff Commission

Copyright, 1949
W. A. GRAHAM CLARK

Printed and Published in the United States of America
by Clark Publishing Company, Charlotte 1, N. C.

16171

151581
C6
1949

PREFACE

This book is intended primarily for use in the mill, as an aid to those who have to make calculations dealing with cotton cloth. It can be used as a text book.

There is apparently a need for a work of this character, as there have been few books dealing with weave room calculations from the practical standpoint and most of these are out of print.

The first part of this study contains concise rules for making cloth calculations and these have been grouped to facilitate use. The cloths used to illustrate the working out of the rules are mainly staple plain fabrics such as occur most largely in actual practice. One of the most original features is that dealing with the ascertainment of the contraction in length of warp and filling yarns in the weaving of plain fabrics; in addition to rules there has been compiled a table that shows the contraction percentages for a wide range of combinations of yarn counts and spacings and this is illustrated graphically. Attention is called to this particularly because most textile books gloss over this vital phase by intimating that it is impossible to formulate practical rules for ascertaining the contraction in length of yarns during weaving.

The second part of this book lists over one thousand typical American cloths and shows full particulars including the numbers of yarn used in each case. These cloths have been carefully selected and arranged and this tabulation should prove of value alike to cloth manufacturers, cloth dealers, and textile students.

A short chapter is added to show the systems used in numbering yarns of different materials, and to bring out salient facts as to materials of interest to the cotton weaver.

In the appendix are to be found tables of the usual weights and measures, also metric conversions for those interested in export trade.

W. A. GRAHAM CLARK.

Washington, D. C., July 1, 1920.

SMTI LIBRARY

Preface To Second Edition

In issuing this second edition, made necessary by reason of the continuing demand and the exhaustion of the supply, advantage has been taken of the opportunity to greatly enlarge the list of typical American cotton cloths, so as to include more than 3,100 fabrics, and to improve the system of classification. The table and chart relative to the percentage of yarns contraction in the weaving of ordinary plain cotton cloths have been extended to cover a wider range. These and other additions and improvements will, it is hoped, prove of value to the industry.

W. A. GRAHAM CLARK.

Washington, D. C., July 1, 1926.

Preface To Third Edition

Since exhaustion of the second edition there have been many requests for this book from men actively engaged in the manufacture and sale of cotton goods, and a large number of increasingly urgent requests from textile school students and professors. The latter are primarily interested in the first part of the book, that dealing with cotton cloth calculations. In the revision of the first part there have been included some additional rules and also some further pertinent information, particularly as to loom speeds and the number of looms per weaver. An interesting feature is a table showing for one printcloth of large production details of manufacture in each of 24 separate mills.

The second part of the book shows full particulars (width, weight, ends and picks, and warp and filling yarn numbers) for several thousand cotton cloths, grouped in tables which cover various sectors of the weaving industry. In the revision there have been added more than 700 additional fabrics, many of which became of importance during World War II. For some 1,900 plainwoven cotton cloths there have been added data as to the BYT (effective yards of yarn per pound of cloth) which serves as the basis of the classification into groups.

W. A. GRAHAM CLARK.

Washington, D. C., September, 1949.

CONTENTS

CLOTH CALCULATIONS: Page

Introduction 11
Yarn contraction in weaving 14
Cloth regain 19
Reed calculations 21
Warp length compared with cloth length 28
Contraction in weaving plain cloths 31
Table 1—Percentages, tabulated Faces 24
Chart A—Percentages, charted Faces 25
Average yarn number 33
The cloth constant 37
Construction calculations 46
Width calculations 48
Weight calculations 51
Percentages of warp, filling, and sizing 54
Selection of yarn numbers to make a certain cloth 59
Checking the correctness of any stated yarn combination 63
Weight of cloth from weight of a small sample 68
Cloth analysis 71
Proluction problems 79
Table 2—Yards of cloth per loom per hour 89
Loom speeds 96
Transmission Problems 103

TYPICAL AMERICAN COTTON CLOTHS

PART 1—UNBLEACHED CLOTHS:

Section A—Plainwoven Cloths:

Osnaburgs (6s range) 112
Osnaburgs (10s range) 113
Coarse sheetings (14s range) 114
Coarse sheetings (18s range) 118
Sheetings (22s range) 121
Sheetings (26s range) 129
Cheesecloths (including tobacco cloths) 132
Printcloths 136
Medium-fine plains (warp mainly 40s) 147
Medium-fine plains (warp mainly 50s) 149
Fine plains (warp mainly 60s) 151

Fine plains (warp mainly 80s) 154
Extra-fine plains (warp mainly 100s) 157
Extra-fine plains (warp mainly 120s) 158

Section B—Special Plainwoven Cloths:

Typewriter cambrics 159
Balloon cloths 160
Filter cloth 160
Tracing cloths 160
Dimity cords 160
Pongees and soisettes 161
Poplins (single, semi, and ply) 162
Broadcloths (single, semi, and ply) 163
Voiles (single, semi, and ply) 166
Crepe kimono cloths 167
Airplane cloths 167
Curtain scrims 167
Beach cloths 168
Flannelets 168

Section C—Twills and Sateens:

Drills (coarse 3-leaf warp twills 170
Jeans (closewoven drills) 174
3-leaf warp twills 175
3-leaf filling twills 176
3-leaf twills, combed 177
4-leaf warp twills 177
4-leaf filling twills 180
Alberts (5-leaf filling twills 180
Gabardines (steep warp twills) 181
5-harness warp sateens 181
5-harness warp sateens, combed 184
5-harness filling sateens 185
5-harness filling sateens, combed 187
8-harness warp sateens 187
Army-uniform twills (4-harness) 188
Wind-resistant Byrd cloth (4-harness) 188
Army wind-resistant sateens (5-harness) 188

Section D—Special Cloths Other Than Plainwoven:

Flannel twills (3- and 4-leaf) 190
Filter twills (4-leaf, 2 up and 2 down) 191
Chain filter cloths (4-leaf broken twills) 191
Corset coutils 191
Momie crepes 192
Pajama checks (carded dimities) 192

Lawn checks (combed dimities) 193
Satin-stripe shirtings (dobby-woven) 193
Clipped-spot lawns (dobby-woven) 194
Curtain Madras (clipped designs) 194
Mosquito nettings (leno-woven) 194
Plain marquisettes (leno-woven) 194
Clipped-spot marquisettes (leno-woven) 194
Birdseye diaper cloths 195
Gauze diaper cloths 195
Bedford cords ("warp piques") 195
Piques (dobby-woven) 196
Waffle (pique) cloths (dobby-woven) 196
Moleskins (filling sateens, mostly 8-harness 196
Corduroys 196
Plain-back velveteens 198
Twill-back velveteens 198
Bedspreads (crochet, Marseilles, satin) 199

Section E—Duck Fabrics:

Heavy naught ducks 200
Sail ducks (hard texture) 200
Sail ducks (medium texture) 201
Wide number ducks (harvester ducks, etc.) 201
Army ducks 202
Bag ducks 203
Belt ducks 203
Hose ducks 204
Boot ducks 204
Shoe ducks 204
Mattress ducks (single filling) 204
Enameling ducks (taped warp; double filling) 204
Flat ducks (taped warp; single filling) 205
Waste ducks (taped warp; single filling) 206

Section F—Tire Fabrics:

Cord fabrics (plainwoven) 207
Builder fabrics (plainwoven) 207
Chafer fabrics (plainwoven) 207
Breaker fabrics (plainwoven, mock leno, and leno-woven) 208

PART 2—YARN-DYED CLOTHS:

Denims 209
Denim stripes, incl. hickory, express, etc. 211
Beach stripes (3-leaf warp twills 211
Coverts 211

Cotton suitings 212
Cotton ply-yarn suitings 212
Outing flannels 213
Pin checks 213
Cheviot shirtings 213
Work-shirt chambrays 214
Romper cloths 214
Coarse plaids 214
Coarse ginghams 215
Ginghams 216
Fine ginghams 216
Fine Jacquard shirtings 217
Oxford shirtings 217
Seersuckers 217
Dimity bedspreads (seersucker stripes) 217
Straw tickings 218
Tickings 218
Sateen tickings 218
Nankin tickings 218
Awning stripes 219
Table damasks 219
Upholstery reps 219
Tapestries 219
Cotton blankets 220
Glass cloths 220
Crash toweling 220
Huckaback toweling 221
Turkish toweling 221
Cotton rag rugs ("hit-and-miss" type) 221

TEXTILE FIBERS AND YARN NUMBERING:

Introduction 225
Table. Textile fibers: U. S. mill consumption, 1921-1948 229
Raw cotton 230
Table. Cotton yarns: Yards per pound 233
Rayon 234
Noncellulosic synthetic fibers 237
Table. Denier equivalents in cotton yarn numbers 238

APPENDIX:

United States weights and measures 243
Metric and English equivalents 243
Metric and English conversions 244

COTTON CLOTH CALCULATIONS

COTTON CLOTH CALCULATIONS

Introduction

In cloth calculations the basic factors are the yarns and their spacings, in other words the warp count, the filling count, the sley, and the pick. The other factors are all based on these. Every factor is part of a mathematical equation so that no factor can be changed without involving a change in one or more other factors in order to make the equation balance. The problem is to define the nature of the relationship between various factors so that in cloth calculations any unknown factor may be readily ascertained from its relationship to known factors.

The study of cloth calculations and the use of the most concise rules would be much aided if each factor had a standard symbol; for instance, there is a saving of both time and space in using the letter "T" instead of writing out "total single threads per square inch" or "the sum of the single threads in sley and pick." It would be well if the cotton trade and industry would adopt uniform symbols for the various factors that occur in cloth calculations. For convenience in remembering, the symbol used in each instance should be, where possible, the first letter of the factor for which it stands. The following symbols are used in this work and are recommended for general use.

Symbols. *Cloth factors.*

A = Actual average yarn number or count.
A′ = Official average yarn number or count, as obtained by "straight line" method that disregards yarn contraction in weaving.*
B = Breadth (width) of cloth, in inches.
B′ = Breadth (width) of warp in reed, in inches.
C = Cloth constant that allows for contraction of yarns in weaving and for weight added to yarns by sizing.

*It is called "official" because it is officially used by the Government as the standard, of relative fineness, for the progressive rates of duty levied on cotton cloths. In deriving the official average yarn number, the yarns are considered as unsized and as lying in the cloth in straight lines; in other words, "C" is taken as 840, the full yards in a hank, without deduction for contraction or sizing.

d = diameter of average yarn number, in inches.
E = Ends of warp per inch of cloth.
E′ = Ends of warp per inch in reed.
e = distance between warp ends in cloth, in inches.
F = Filling yarn number.
H = Hank length, in yards, per pound. For cotton, H = 840.
K = Kilos per 100 linear meters.
K′ = Kilos per 100 square meters.
L = Length of cloth, in yards.
L′ = Length of warp, in yards.
N = Total number of ends in warp.
P = Picks of filling per inch of cloth.
p = distance between picks in cloth, in inches.
R = Reed dents per inch.
r = distance between warp ends in reed, in inches.
S = Square yards per pound.
T = Total *single* threads per square inch of cloth (= E × ply + P × ply).
U = 1 minus percentage of warp contraction.
V = 1 minus percentage of filling contraction.
W = Warp yarn number.
Y = Yards (linear) per pound.
Z = Ounces per linear yard.
Z′ = Ounces per square yard.

The basic cloth calculation equation is AC = BYT. This equation is seen to be a condensation, by the use of symbols, of the statement that the actual average yarn number multiplied by the cloth constant is equal to the width of the cloth in inches multiplied by the linear yards per pound multiplied by the total single threads per square inch. From this basic equation are derived many other equations involving the relationship of the various cloth factors. This basic equation will be discussed in detail later on.

Cloth calculations are also, sometimes, facilitated by the use of certain constant numbers. For instance, in calculations involving 7000 (grains in a pound) and 840 (yards in a hank), the constant 8.33 can be substituted if the 7000 is divided by the 840, or the constant .12 can be substituted if the 840 is divided by the 7000. Similarly .2314 can be substituted for 7000 divided by 36 × 840, or 4.32 can be substituted for 36 × 840 divided by 7000. In simple equations, however, it is often quicker to cancel numbers common to both dividend and divisor rather than to substitute decimal numbers.

A "cloth constant" is used to compensate for yarn contraction

(take-up) in width and in length and for sizing on warp. It is, however, constant only for the particular set of conditions stated and in the following pages the method of ascertaining it for any known set of conditions is fully stated.

A description of a cloth involves stating the width, the ends per inch, the picks per inch, the warp yarn number, the filling yarn number, and the weight. For instance, a full description of the cloth that is most typical of the American cotton industry today would be: A 38½-inch, 64 × 60, 30s.40s, 5.35-yard printcloth. This description gives every essential particular for such plain woven cloth in the gray. In commercial quotations the yarn counts are usually omitted and different mills use slightly different yarn numbers, and slightly different percentages of sizing on the warp, to get the same result.

The number of warp threads or "ends" per inch in the cloth is known as the sley, whereas the number of filling threads per inch in the cloth is known as the pick. The term "cloth construction" usually refers to the ends and picks in a square inch of cloth, thus the construction of the printcloth above is 64 × 60. In stating the construction the sley is always given first and the pick second, the 64 in this case therefore referring to the ends of warp per inch and the 60 to the picks of filling per inch. Similarly in giving yarn numbers, say 30s.40s, the warp yarn number is stated first and the filling yarn number second.

The term "printcloth" implies that the fabric is plainwoven (1-up, 1-down) and unbleached. If not indicated by the trade name, the description should be completed by listing the weave (plainwoven, twill, satin, dobby, jacquard, leno, etc.) and the location of the fabric in the five-color classification (unbleached, bleached, printed, piece-dyed, yarn-dyed), also any special finish or treatment (mercerized, sanforized, schreinered, etc.).

Yarn Contraction In Weaving

The width of the woven cloth is less than the width of the warp in the reed. The length of the woven cloth is less than the length of the warp from the slasher. The contraction (also called take-up or shrinkage) in length of the warp and filling yarns during weaving is affected by several factors but as it is due to the necessity of the two sets of interweaving threads bending out of their course to pass around each other it depends primarily on the spacing of the yarns and on their diameters. The subject of contraction, which merits more attention than is usually given to it, may be clarified by stating certain known facts in regard thereto.

Other things being equal, the more the interlacings the more the contraction and hence the greater the length of yarn required to produce a specified length and width of cloth. Using the same yarn combination, say 30s warp and 40s filling, the contraction in warp and in filling in the weaving of an 80x80 longcloth will be greater than in the weaving of a 60x60 printcloth and much greater than in the weaving of a 40x40 cheesecloth. Using the same yarns in the same construction, a square yard of cloth will require the greatest length of yarn when the ordinary plain weave is used; a less length of yarn will be required for the 2-up and 1-down twill, a lesser length of yarn for the 2-up and 2-down twill, and a still lesser length of yarn for a sateen weave. It is obvious that this must be so because in the ordinary plain weave, 1-up and 1-down, each warp and filling thread is bent out of its course with each lift of the harness whereas in the case of other weaves a portion of the threads continue in a straight line, floating under or over two or more threads of the opposite set, during two or more lifts of the harness.

Other things being equal, the finer the average yarn number the less the contraction and therefore the less the length of yarn required to produce a specified length and width of cloth. Using the same construction, say 64x64, a square yard of sheeting made with 20s and 25s yarns will require a greater length of warp and filling than will a printcloth made with 30s and 40s and this in turn will require a greater length of warp and filling than will a lawn made with 60s and 80s yarns.

The more compact the texture of the cloth the greater the contraction of yarn in weaving, conversely the more open the texture the less the contraction. The texture, however, is governed by the relation of construction and yarn numbers. Normally the finer (closer) the construction the finer the yarns that are used therein but for closely compacted cloths the yarns used are coarser than normally pertain to the construction used; the reverse condition obtains as to open-woven fabrics. For this reason, the foregoing rules, as to contraction increasing with the fineness of the construction and decreasing with the fineness of the yarns, were modified by the clause "other things being equal." For instance, a typewriter cambric woven of 100s warp and filling in 158x158 construction is more closely compacted and will take up more in warp and filling than will an osnaburg woven of 8s warp and filling in 30x30 construction. Conversely, a voile woven 60x60, of 60s warp and filling, is more open woven and will take up less in warp and filling than will a sheeting woven 40x40, of 15s warp and filling.

The total contraction in warp and filling is seen to be dependent on various factors but mainly on the spacing, the average yarn number, and the relation of spacing to average yarn number. The relation of warp contraction to filling contraction is also dependent upon various factors but particularly on the relation of the sley to the pick, of the warp yarn number to the filling yarn number, and of the warp yarn twist to the filling yarn twist; it is also affected by the mechanical adjustment of the loom.

When sley and pick are equal and the warp and filling of the same number, the contraction should theoretically be the same in length and in width; in actual practice, however, as found by analysis of various cloths of this type, the warp contraction is invariably the greater.

The softer the yarn the easier it is to bend, therefore, other things being equal, the softer the filling twist the greater the contraction in the filling and the less the contraction in the warp. The use of warp twist in the filling lessens the filling contraction and increases the warp contraction.

Drills (warp twills) will shrink more in width and less in length than will filling twills of the same class. Warp sateens will shrink more in width and less in length than will filling sateens of the same class. For instance, using say 32s warp and 38s filling, a 104x64 warp sateen will take up more in filling and less in warp than will a 64x104 filling sateen.

The relative contraction of warp and filling in special plain-woven cloths distinguished by warp or filling ribs is not subject

to the same rules as govern ordinary plainwoven cloths. In ordinary plainwoven cloths the more the ends per inch the greater the length of filling required to bend around them but in special plainwoven cloths the warp threads may be reeded so closely that it is difficult for the filling to enter between them, with the result that the filling remains in almost a straight line and the warp has to do practically all the bending. Among such special plainwoven fabrics having a great preponderance of ends over picks may be noted repps, poplins, and cotton broadcloths, also ducks. For instance, analysis of a cotton broadcloth woven 144x76, of 100/2 ply warp and filling, showed 13% warp contraction and only 4% filling contraction, and analysis of a No. 12/0 cotton duck woven 20x13, of 7/13 ply warp and filling, showed 22% warp contraction and only 2% filling contraction. In the case of warp cords made with a great preponderance of picks over ends the reverse condition obtains, that is, the warp is held in straight lines and the filling is made to do almost all the bending.

The relative contraction in warp and in filling is affected not only by the nature of the fabric but also by the type of loom used and the mechanical adjustments thereof, although it should be noted that, other things being equal, any increase in the warp contraction involves a decrease in the filling contraction, and vice versa.

If the tension on the warp be increased, the warp threads become tighter and are harder to bend, with the result that more bending must be done by the filling. An increase in the tension on the warp therefore reduces the warp contraction and increases the filling contraction and the cloth produced will be longer and narrower. Conversely, a decrease in the tension exerted on the warp makes the warp threads slacker and easier to bend, with the result that less bending has to be done by the filling and the cloth produced is shorter and wider.

The relative amount of contraction in warp and filling varies slightly with the amount of "cover" in weaving. If the whip roll be raised to put more cover on the cloth then a straight line drawn from the whip roll to the breast beam will pass above the dip of the warp in the bottom shed when the pick is inserted. In this case, while the warp yarn in the bottom shed is under extra stress, that in the top shed is comparatively slack and is more readily bent around the filling pick in beating up. Therefore raising the whip roll, and thus giving a better cover to the cloth, results in an increase of the warp contraction and a decrease of the filling contraction.

The closer the sand roller to the fell of the cloth the less the

opportunity for contraction in width of the cloth before it is wound up. Therefore the automatic loom with high roll take-up, as compared with the non-automatic loom with low roll take-up, will produce wider cloth from the same warp in the same reed, and to produce the same cloth width requires the width of warp in reed to be reduced by the use of a finer reed. For instance, in weaving the standard 38½-inch, 64x60, 5.35-yard printcloth it is customary to use a 29.7 dent reed on the non-automatic loom with low roll take-up and a 30 dent reed on the automatic loom with high roll take-up. In this as in other instances of mechanical adjustments, a decrease in filling contraction involves an increase in warp contraction, and vice versa, so that the total contraction, and hence the total length of yarn required, is not materially altered.

Any variation in the spacing of interlacings or in the diameter of the yarn means a variation in the contraction and hence in the length of yarn required to weave a certain length and width of cloth.

To find filling contraction, knowing cloth width and width warp in reed:

RULE 1.—*Subtract the width in cloth from the width in reed and divide by the width in reed.*

EXAMPLE: The warp for a 36-inch sheeting was spaced 39⅜ inches in reed. What was the contraction from reed to cloth?

ANSWER:

$$\frac{B' - B}{B'} = \frac{39.375 - 36}{39.375} = 8.57\% \text{ filling contraction.}$$

To find warp contraction, knowing cloth length and warp length:

RULE 2.—*Subtract the length of cloth from the length of warp and divide by the length of warp.*

EXAMPLE: A 40-yard cut of sheeting was made from 43¾ yards of warp. What was the contraction from warp to cloth?

ANSWER:

$$\frac{L' - L}{L'} = \frac{43.75 - 40}{43.75} = 8.57\% \text{ warp contraction.}$$

To find length of filling or warp used, knowing cloth width or length and the contraction percentage:

RULE 3.—*Divide the cloth width or length by 1 minus the percentage of contraction.*

EXAMPLE: A heavy sheeting is 36 inches wide and 40 yards long. If the filling contraction is 8.57% and the warp contraction also 8.57%, what is the width of warp in reed and the length of warp required?

ANSWER:

$$B' = \frac{B}{V} = \frac{36}{1 - .0857} = \frac{36}{.9143} = 39.375 \text{ inches width in reed.}$$

$$L' = \frac{L}{U} = \frac{40}{1 - .0857} = \frac{40}{.9143} = 43.75 \text{ yards warp required.}$$

Cloth Regain

Expressed in inches, contraction and regain are the same. Expressed in percentages, as is more customary, contraction and regain are never the same, as the percentage of contraction is based on the original width or length whereas the percentage of regain is based on the finished width or length. Errors are occasionally made in cloth calculations through confusing regain with contraction and an illustration may be useful in emphasizing the difference.

Suppose the width of warp in reed to be 30 inches and the width of cloth made therefrom to be 28½ inches. The warp has shrunk 1½ inches in width from reed to cloth and the cloth would need to regain 1½ inches to attain the original width of the warp in the reed.

The percentage of contraction in width is the original width minus the finished width, divided by the original width. In this case:

$$\frac{B' - B}{B'} = \frac{30 - 28\frac{1}{2}}{30} = \frac{1\frac{1}{2}}{30} = \frac{1}{20} = 5\% \text{ contraction.}$$

The percentage of regain to be added to the cloth width to give the original width of warp in reed is equal to the original width minus the finished width, divided by the finished width. In this case:

$$\frac{B' - B}{B} = \frac{30 - 28\frac{1}{2}}{28\frac{1}{2}} = \frac{1\frac{1}{2}}{28\frac{1}{2}} = \frac{1}{19} = 5.26\% \text{ regain.}$$

The same relation between contraction and regain applies to the warp as well as to the filling. Suppose 63 yards of warp from the slasher are required to produce a 60 yard cut of cloth. Then the warp contraction is

$$\frac{L' - L}{L'} = \frac{63 - 60}{63} = 4.76\%$$

and the regain is

$$\frac{L' - L}{L} = \frac{63 - 60}{60} = 5\%.$$

In the case of either warp or filling, therefore, the percentage of regain is always more than the percentage of contraction.

From the above the relationship between contraction and regain is seen to be as follows:

$$\text{Per cent contraction} = 1 - \frac{1}{1 + \%\ \text{regain}}$$

$$\text{Per cent regain} = \frac{1}{1 - \%\ \text{contraction}} - 1$$

and $(1 = \%\ \text{contraction}) \times (1 + \%\ \text{regain}) = 1.$

Reed Calculations

Calculations for reed, for contraction in width, and for regain in width, are interdependent and a rule for one implies a rule for the others. This is sometimes overlooked and we have the anomaly afforded by a writer stating that it is impossible to formulate a rule for contraction in width and then going ahead and stating a rule for ascertaining the reed to give a certain sley.

There is one point here that should be noted. Contraction in width from reed to cloth is based on width of warp in reed, and regain in width from cloth to reed is based on cloth width. The width between ends, however, is a reciprocal of the ends per inch, that is, 64 ends to the inch means that the threads are spaced 1/64 of an inch apart. In reed calculations, therefore, the use of contraction and regain percentages must be the reverse of their use in width calculations. For instance, if the filling contraction in a 36-inch, 48x48, sheeting is 8.57% we would find width of warp in reed by dividing 36 by .9143 (i. e., by 1 minus 8.57%), obtaining 39.375 inches, but we would find the reed by multiplying 48 by .9143, obtaining 43.88 ends per inch in reed and this latter divided by 2 ends per dent would give 21.94 dents per inch.

Warps may be sleyed 1, 2, 3, 4, or more, ends to the dent; for ordinary plain cloth 2 ends to the dent is the rule. In reed calculations it is only necessary to give rules for finding the ends per inch in reed as the dents per inch are obtainable therefrom by dividing by a simple number.

To find dents per inch in reed, knowing ends per inch in reed and ends per dent:

Rule 4.—*Divide ends per inch in reed by ends per dent.*

Example: A warp is to be drawn in with 60 ends to the inch in the reed. What reeds would be required if the warp were sleyed 1, 2, 3 or 4 ends per dent, respectively.

Answer: If there are 60 ends to the inch a 60 reed is required for 1 end per dent; a 30 reed for 2 ends per dent; a 20 reed for 3 ends per dent; a 15 reed for 4 ends per dent.

To find number of dents occupied by an equally reeded warp, knowing total ends, selvage ends, and ends per dent:

RULE 5.—*From total ends subtract half the selvage ends and divide by number of ends per dent.*

EXAMPLE: A 38½-inch, 64x60, print cloth is woven with 2488 ends in the warp, including 48 selvage ends drawn in 4 ends to the dent. How many dents required?

ANSWER: $\frac{2488 - 24}{2} = 1232$ dents total.

NOTE—2440 divided by 64 = 38.125 inches in body of the cloth, and 48 divided by 128 (i. e., 2x64) = 0.375 inch in selvages; 38.125 + .375 = 38.5 inches total.

To find width of warp in reed, knowing total ends in warp, selvage ends, ends per dent, and reed:

RULE 6.—*From total ends subtract half the selvage ends and divide by ends per dent and by dents per inch.*

EXAMPLE: A print cloth is woven with 2488 ends in the warp; of these, 2440 are drawn in 2 to the dent and 48 are selvage ends drawn in 4 ends to the dent. Using a 30 dent reed, what is width of warp in reed?

ANSWER: $\frac{2488 - 24}{2 \times 30} = 41.07$ inches in reed

To find reed required to produce a given sley with a known or estimated contraction in width from reed to cloth:

RULE 7.—*Multiply ends per inch in cloth by 1 minus the percentage of filling contraction; divide result by ends per dent.*

EXAMPLE: A print cloth has 64 ends per inch in the cloth. How many dents per inch in reed if filling contraction be taken as 6½%?

ANSWER: 1 — .065 = .935. 64 × .935 = 59.84. For plain cloth there are used 2 ends per dent so 59.84 ÷ 2 = 29.92 dent reed.

NOTE—If the regain had been given instead of the contraction, say 6.95% filling regain, then the reed would have been found by division instead of by multiplication, thus 64 ÷ 1.0695 = 59.84 and this divided by 2 ends per dent would have given the same 29.92 dent reed as above.

To find average number of ends per inch in an unequally reeded fabric, knowing the ends and dents per pattern and the reed:

RULE 8.—*Multiply number of ends in one pattern by number of reed; divide result by number of dents in pattern.*

EXAMPLE: What is the average number of ends per inch in reed if the warp is drawn in with 24 ends in 12 dents and 48 ends in 12 dents alternately, using a 30 dent reed?

ANSWER:

$$\frac{\text{72 ends in pattern} \times \text{30 dent reed}}{\text{24 dents in pattern}} = 90 \text{ average ends per inch in reed.}$$

To find ends per inch in reed, knowing the sley and the yarn numbers:

RULE 9.—*Square the distance between warp ends in the cloth and add the square of the diameter of the average yarn number. The reciprocal of the square root of their sum is the number of ends per inch in reed.*

EXAMPLE: A print cloth is to be made with 64 ends of 30s warp and 60 picks of 39s filling. How many ends per inch in reed required?

ANSWER: The average yarn number (as figured by Rule 21) is 33.8s and this has 33.8 × 840 or 28,392 yards per pound. The square root of 28,392 is 169 and the diameter of 33.8s yarn is therefore $\frac{1}{169}$ inch. The distance between warp ends is equal to the reciprocal of the sley, in this case it is 1/64 inch. Let r = distance between ends in reed, e = distance between ends in cloth, and d = diameter of average yarn number. Then

$$r^2 = e^2 + d^2$$

$$= (1/64)^2 + (1/169)^2 \qquad \text{(A)}$$

$$= \frac{1}{4{,}096} + \frac{1}{28{,}392} \qquad \text{(B)}$$

$$= \frac{28{,}392 + 4{,}096}{28{,}392 \times 4{,}096} = \frac{32{,}488}{116{,}293{,}632} \qquad \text{(C)}$$

$$= \frac{1}{3579.5873} \qquad \text{(D)}$$

$$\text{and } r = \sqrt{\frac{1}{3579.5873}} = \frac{1}{59.83} \qquad \text{(E)}$$

Therefore 59.83 is number of ends per inch in reed. With 2 ends to the dent we have 59.83 ÷ 2 = 29.91 dents per inch in reed.

Since the diameter of yarn is equal to the reciprocal of the square root of the number of yards to the pound, and since the above rule calls for the squaring of the diameter, which gets back to the number of yards to the pound, the equation (A) may be eliminated and the above rule shortened to the following:

Rule 9-a.—*To the square of the reciprocal of the sley add the reciprocal of the number of yards to the pound of the average yarn number. The reciprocal of the square root of their sum is the number of ends per inch in reed.*

Note—From equation (B) it is seen that the spacing between ends in the cloth has a much more important influence on the reed and hence on the contraction between reed and cloth than has the diameter of the yarns. In obtaining equation (C) we add 28,392 and 4,096 to get the dividend 32,488 and multiply 28,392 by 4,096 to get the divisor 116,293,632. Dividing 116,293,632 by 32,488 we simplify the equation (C) to the equation (D). The square root of the latter represents the distance between ends in the reed so its reciprocal 59.83 must be the number of ends per inch in the reed.

Having the number of ends per inch in the reed and in the cloth the contraction from reed to cloth is simply a matter of subtraction and division, thus in the above case, (64 — 59.83) ÷ 64 = 6.52% filling contraction. The above rule for obtaining ends per inch in reed therefore implies also a rule for ascertaining the filling contraction.

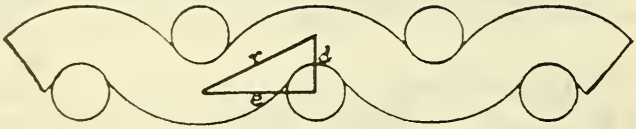
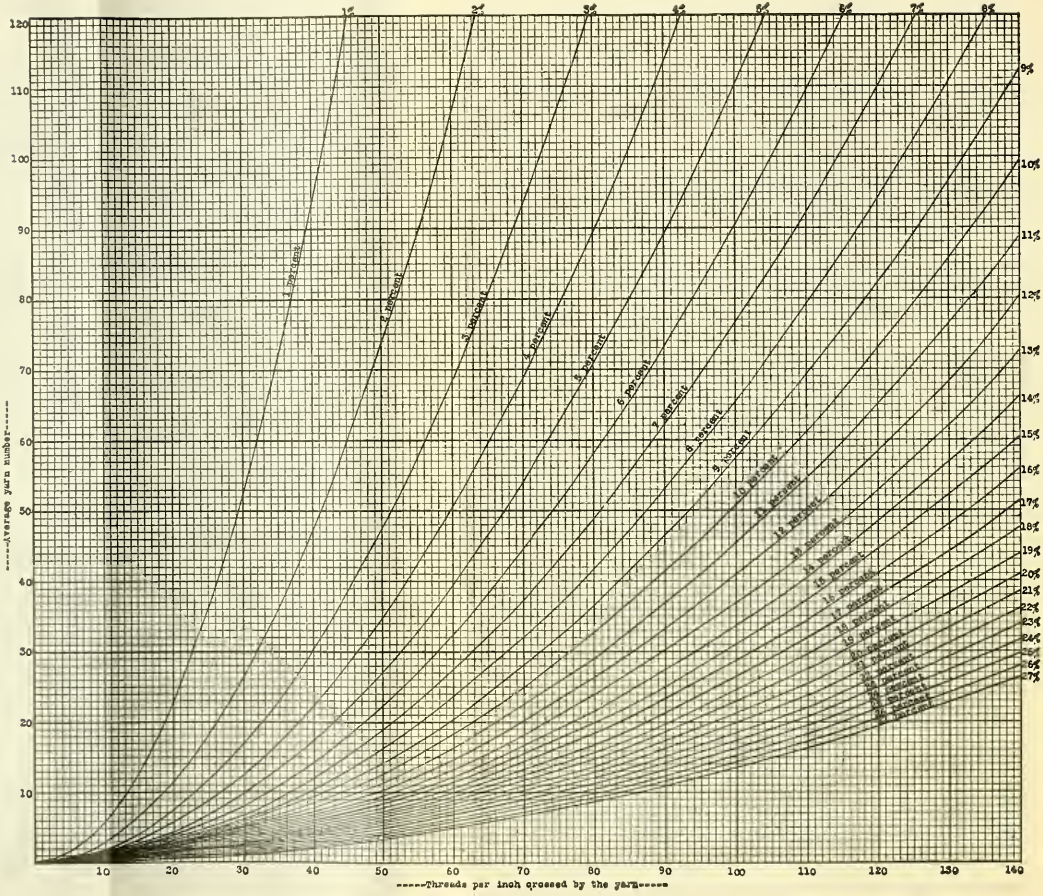


Fig. 1.

Explanation of Rule 9:

Rule 9 is almost obvious from Fig. 1 herewith which represents


1 percent
2 percent
3 percent
4 percent
5 percent
6 percent
7 percent
8 percent
9 percent
10 percent
11 percent
12 percent
13 percent
14 percent
15 percent
16 percent
17 percent
18 percent
19 percent
20 percent
21 percent
22 percent
23 percent
24 percent
25 percent
26 percent
27 percent
1%
2%
3%
4%
5%
6%
7%
8%
9%
10%
11%
12%
13%
14%
15%
16%
17%
18%
19%
20%
21%
22%
23%
24%
25%
26%
27%
-----Average yarn number-----
-----Threads per inch crossed by the yarn-----

Average yarn number	Threads per inch crossed by the yarn: 4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140	Average yarn number
120											0.9	1.1	1.3	1.5	1.7	1.9	2.2	2.5	2.7	3.0	3.3	3.6	3.9	4.3	4.6	5.0	5.3	5.7	6.1	6.5	6.9	7.3	7.7	8.1	8.5	120
110											1.0	1.2	1.4	1.6	1.9	2.1	2.4	2.7	3.0	3.3	3.6	3.9	4.2	4.6	5.0	5.4	5.8	6.2	6.6	7.0	7.4	7.8	8.3	8.7	9.2	110
100										0.9	1.1	1.3	1.5	1.7	2.0	2.3	2.6	2.9	3.2	3.6	4.0	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.2	7.6	8.0	8.5	9.0	9.5	10.0	100
90									0.9	1.0	1.2	1.5	1.7	2.0	2.3	2.6	2.9	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.5	6.9	7.4	7.9	8.3	8.8	9.3	9.8	10.4	10.9	90
80									1.0	1.2	1.4	1.7	2.0	2.3	2.6	2.9	3.3	3.6	4.0	4.4	4.9	5.3	5.8	6.2	6.7	7.2	7.7	8.2	8.7	9.2	9.8	10.3	10.8	11.4	12.0	80
70								0.9	1.1	1.3	1.6	1.9	2.2	2.5	2.9	3.3	3.7	4.1	4.6	5.0	5.5	6.0	6.5	7.0	7.5	8.1	8.6	9.2	9.8	10.4	11.0	11.6	12.2	12.8	13.4	70
60								1.0	1.3	1.6	1.9	2.2	2.6	3.0	3.4	3.8	4.3	4.8	5.3	5.8	6.3	6.9	7.5	8.1	8.7	9.3	9.9	10.5	11.2	11.8	12.5	13.1	13.8	14.5	15.2	60
50							0.9	1.2	1.5	1.8	2.2	2.6	3.0	3.5	4.0	4.5	5.0	5.6	6.2	6.8	7.5	8.1	8.8	9.4	10.1	10.8	11.5	12.2	13.0	13.7	14.4	15.2	15.9	16.7	17.4	50
40							1.1	1.5	1.9	2.3	2.8	3.3	3.8	4.4	5.0	5.6	6.2	6.9	7.6	8.3	9.0	9.8	10.6	11.4	12.2	13.0	13.8	14.7	15.5	16.3	17.2	18.0	18.8	19.6	20.5	40
39							1.2	1.5	1.9	2.3	2.8	3.3	3.9	4.5	5.1	5.7	6.4	7.1	7.8	8.5	9.3	10.1	10.9	11.7	12.5	13.3	14.1	15.0	15.8	16.6	17.5	18.3	19.2	20.0	20.9	39
38							1.2	1.6	2.0	2.4	2.9	3.4	4.0	4.6	5.2	5.8	6.5	7.2	8.0	8.7	9.5	10.3	11.1	11.9	12.7	13.6	14.4	15.3	16.1	16.9	17.8	18.7	19.6	20.4	21.3	38
37							1.2	1.6	2.0	2.5	3.0	3.5	4.1	4.7	5.3	6.0	6.7	7.4	8.2	8.9	9.7	10.5	11.3	12.1	12.9	13.8	14.7	15.6	16.5	17.3	18.2	19.1	20.0	20.8	21.7	37
36						0.9	1.3	1.7	2.1	2.6	3.1	3.6	4.2	4.8	5.5	6.2	6.9	7.6	8.4	9.2	10.0	10.8	11.6	12.4	13.2	14.1	15.0	15.9	16.8	17.7	18.6	19.5	20.3	21.2	22.1	36
35						1.0	1.3	1.7	2.1	2.6	3.1	3.7	4.3	4.9	5.6	6.3	7.0	7.8	8.6	9.4	10.2	11.0	11.8	12.7	13.6	14.5	15.4	16.3	17.2	18.1	19.0	19.9	20.8	21.7	22.5	35
34						1.0	1.3	1.7	2.2	2.7	3.2	3.8	4.4	5.1	5.8	6.5	7.2	8.0	8.8	9.6	10.4	11.2	12.1	13.0	13.9	14.8	15.7	16.6	17.6	18.5	19.4	20.3	21.2	22.1	23.0	34
33						1.0	1.4	1.8	2.3	2.8	3.3	3.9	4.5	5.2	5.9	6.6	7.4	8.2	9.0	9.8	10.7	11.6	12.5	13.4	14.3	15.2	16.1	17.0	18.0	18.9	19.8	20.7	21.6	22.5	23.5	33
32						1.0	1.4	1.8	2.3	2.8	3.4	4.0	4.7	5.4	6.1	6.8	7.6	8.4	9.2	10.1	11.0	11.9	12.8	13.7	14.6	15.6	16.5	17.4	18.4	19.3	20.2	21.1	22.1	23.0	24.0	32
31						1.1	1.5	1.9	2.4	2.9	3.5	4.1	4.8	5.5	6.2	7.0	7.8	8.6	9.5	10.4	11.3	12.2	13.1	14.0	15.0	15.9	16.9	17.8	18.8	19.8	20.7	21.6	22.6	23.6	24.5	31
30						1.1	1.5	2.0	2.5	3.0	3.6	4.2	4.9	5.6	6.4	7.2	8.0	8.9	9.8	10.7	11.6	12.5	13.4	14.4	15.4	16.3	17.3	18.3	19.3	20.2	21.2	22.1	23.1	24.1	25.0	30
29						1.1	1.5	2.0	2.5	3.1	3.7	4.4	5.1	5.9	6.7	7.5	8.3	9.2	10.1	11.0	11.9	12.8	13.8	14.8	15.8	16.8	17.8	18.8	19.8	20.7	21.7	22.6	23.6	24.6	25.6	29
28						1.2	1.6	2.1	2.6	3.2	3.9	4.6	5.3	6.1	6.9	7.7	8.6	9.5	10.4	11.3	12.2	13.2	14.2	15.2	16.2	17.2	18.2	19.2	20.2	21.2	22.2	23.2	24.2	25.2	26.2	28
27						1.3	1.7	2.2	2.7	3.3	4.0	4.7	5.5	6.3	7.1	8.0	8.9	9.8	10.7	11.7	12.7	13.7	14.7	15.7	16.7	17.7	18.7	19.7	20.7	21.8	22.8	23.8	24.8	25.8	26.8	27
26						1.3	1.8	2.3	2.8	3.5	4.2	4.9	5.7	6.5	7.3	8.2	9.1	10.1	11.1	12.1	13.1	14.1	15.1	16.1	17.1	18.2	19.3	20.3	21.3	22.4	23.4	24.4	25.4	26.4	27.4	26
25					0.9	1.3	1.8	2.4	2.9	3.6	4.3	5.1	5.9	6.7	7.6	8.5	9.4	10.4	11.4	12.5	13.5	14.5	15.6	16.6	17.7	18.8	19.8	20.9	21.9	23.0	24.0	25.0	26.1	27.1	...	25
24					1.0	1.4	1.9	2.5	3.1	3.8	4.5	5.3	6.1	7.0	7.9	8.8	9.8	10.8	11.8	12.9	13.9	15.0	16.1	17.2	18.2	19.3	20.4	21.5	22.5	23.6	24.7	25.7	26.8	27.8	.....	24
23					1.1	1.5	2.0	2.6	3.2	3.9	4.7	5.5	6.3	7.2	8.2	9.2	10.2	11.2	12.2	13.3	14.4	15.5	16.6	17.7	18.8	19.9	21.0	22.1	23.2	24.3	25.4	26.4	27.5	.....	.....	23
22					1.1	1.5	2.1	2.7	3.4	4.1	4.9	5.7	6.6	7.5	8.5	9.5	10.5	11.6	12.7	13.8	14.9	16.0	17.1	18.2	19.4	20.6	21.7	22.8	23.9	25.0	26.1	27.2	.....	.....	.....	22
21					1.1	1.6	2.2	2.8	3.5	4.2	5.1	5.9	6.9	7.9	8.9	9.9	11.0	12.1	13.2	14.3	15.4	16.6	17.8	18.9	20.1	21.3	22.4	23.5	24.7	25.8	26.9	...	.....	.....	.....	21
20					1.2	1.7	2.3	2.9	3.6	4.4	5.3	6.2	7.2	8.2	9.3	10.3	11.4	12.5	13.7	14.9	16.1	17.3	18.5	19.6	20.8	22.0	23.2	24.3	25.5	26.6	27.7	.....	.....	.....	.....	20
19					1.2	1.8	2.4	3.0	3.8	4.7	5.6	6.5	7.5	8.6	9.7	10.8	11.9	13.1	14.3	15.5	16.7	17.9	19.2	20.4	21.6	22.8	24.0	25.2	26.4	27.5	.....	.....	.....	.....	.....	19
18					1.3	1.9	2.5	3.2	4.0	4.9	5.8	6.8	7.9	9.0	10.1	11.3	12.5	13.7	14.9	16.1	17.4	18.7	20.0	21.2	22.4	23.6	24.8	26.0	27.2	.....	.....	.....	.....	.....	.....	18
17					1.4	2.0	2.6	3.4	4.2	5.2	6.2	7.2	8.3	9.4	10.6	11.8	13.0	14.3	15.6	16.9	18.2	19.5	20.8	22.0	23.3	24.5	25.8	27.0	.....	.....	.....	.....	.....	.....	.....	17
16				0.9	1.5	2.1	2.8	3.6	4.5	5.5	6.5	7.6	8.7	9.9	11.1	12.4	13.7	15.0	16.4	17.7	19.0	20.3	21.7	23.0	24.3	25.5	26.8	.....	.....	.....	.....	.....	.....	.....	.....	16
15				1.0	1.6	2.2	3.0	3.8	4.8	5.8	6.9	8.1	9.3	10.5	11.8	13.1	14.5	15.8	17.2	18.6	19.9	21.3	22.7	24.0	25.3	26.6	27.9	.....	.....	.....	.....	.....	.....	.....	.....	15
14				1.1	1.7	2.4	3.2	4.1	5.1	6.2	7.3	8.6	9.9	11.2	12.5	13.9	15.3	16.7	18.1	19.5	20.9	22.3	23.7	25.1	26.5	27.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	14
13				1.2	1.8	2.5	3.4	4.4	5.5	6.6	7.8	9.1	10.5	11.9	13.3	14.7	16.2	17.6	19.1	20.6	22.1	23.5	34.9	26.3	27.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	13
12				1.3	1.9	2.7	3.7	4.7	5.9	7.1	8.4	9.8	11.2	12.7	14.2	15.7	17.2	18.7	20.3	21.8	23.3	24.8	26.3	27.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	12
11				1.4	2.1	3.0	4.0	5.1	6.4	7.7	9.1	10.5	12.0	13.6	15.2	16.8	18.4	20.0	21.6	23.1	24.7	26.2	27.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11
10				1.5	2.3	3.3	4.4	5.6	7.0	8.4	9.9	11.4	13.0	14.7	16.3	18.0	19.7	21.3	23.0	24.7	26.3	27.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
9			0.9	1.7	2.5	3.6	4.8	6.1	7.6	9.2	10.8	12.5	14.2	15.9	17.7	19.5	21.2	23.0	24.7	26.4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	9
8			1.0	1.9	2.8	4.0	5.4	6.8	8.4	10.1	11.9	13.7	15.6	17.4	19.3	21.2	23.0	24.9	26.7	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8
7			1.2	2.1	3.2	4.6	6.1	7.7	9.5	11.4	13.3	15.2	17.2	19.2	21.2	23.2	25.2	27.1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7
6			1.4	2.4	3.6	5.3	7.0	8.8	10.8	12.9	15.0	17.2	19.3	21.5	23.6	25.7	27.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	6
5			1.7	2.9	4.4	6.2	8.2	10.3	12.6	14.9	17.3	19.6	22.0	24.3	26.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5
4		0.9	2.1	3.6	5.5	7.6	10.0	12.5	15.0	17.7	20.3	23.0	25.6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4
3		1.2	2.7	4.7	7.1	9.8	12.7	15.7	18.7	21.8	24.8	27.8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3
2		1.9	4.0	6.8	10.1	13.7	17.4	21.2	24.9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
1	0.9	3.6	7.6	12.5	17.7	23.0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	128	132	136	140	

Threads per inch crossed by the yarn

Table 1.—PERCENTAGES OF YARN CONTRACTION IN THE WEAVING OF ORDINARY PLAIN COTTON CLOTHS.

a cross section across the cloth and shows how a pick of filling is bent out of its course by having to pass over and under the warp threads. The relation of the reed to the sley is made plain from the triangle having one side marked *d*, one side marked *e*, and the sloping portion, which is known as the hypotenuse, marked *r*.

The side *d* represents the distance from the center of a filling thread to the center of a warp thread at the point where they cross, in other words it is the average diameter of the two. As the diameter of the warp yarn is increased by the addition of sizing, *d* is taken as the diameter of the average yarn number. This is more correct than to use the diameter of the arithmetical average of the warp and filling before weaving but the margin of error in the latter case would usually be very slight.

The side *e* represents the distance between warp ends in the cloth and is therefore the reciprocal of the sley. The hypotenuse *r* represents the distance between warp ends in the reed; this is clear as it is the length of filling required to produce a width of cloth equal to the distance between warp ends. By mathematics the square of the hypotenuse of a right angled triangle is equal to the sum of the squares of the two sides, therefore $r^2 = e^2 + d^2$.

Note—The above rule gives accurate results because it takes into account the effect of variations in the diameters of the yarns as well as in their spacings. In attempts that have been made by same to formulate empirical rules, for quickly ascertaining the reed required, the yarn itself has been disregarded and attention given only to its spacing. We will state three of these "rules of thumb" and then compare them with the more accurate system outlined in Rule 9.

To find approximate ends per inch in reed, knowing sley:

Empirical Rule 10.—Deduct 1 from the sley and multiply by .95.

Empirical Rule 11.—Deduct 1 from the sley and divide by 1.05.

Empirical Rule 12.—Deduct 4 from the sley.

Note—In all cases the reed, in dents per inch, is obtained by dividing the ends per inch in reed by the ends per dent.

Comparison of Rule 9 With Empirical Rules 10, 11, and 12:

The relative accuracy of the results obtained by the use of Rules 9, 10, 11, and 12, respectively, is best illustrated by fabrics made

with identical constructions but different yarns. The following are details of three actual fabrics made in 64x64 construction:

	Sheeting.	Printcloth.	Lawn.
B	39½	38½	28
Y	2.40	5.15	14.34
S	2.63	5.51	11.15
E	64	64	64
P	64	64	64
T	128	128	128
W	16s	30s	60s
F	17s	38s	72s
A	16.5s	33.5s	65.4s
BYT	12,134	25,379	51,395
C	735	757	786

For the cloths stated, the use of Rules 9, 10, 11, and 12, respectively, show the following results:

	Sheeting.	Printcloth.	Lawn.
	Reed dents per inch		
By Rule 9	28.12	29.90	30.87
By Rule 10	29.92	29.92	29.92
By Rule 11	30	30	30
By Rule 12	30	30	30
	Filling contraction		
By Rule 9	12.12%	6.56%	3.53%
By Rule 10	6.48%	6.48%	6.48%
By Rule 11	6.25%	6.25%	6.25%
By Rule 12	6.25%	6.25%	6.25%

The results obtained with Rule 9, that is, a 28.12 dent reed for the sheeting, a 29.90 dent reed for the printcloth, and a 30.87 dent reed for the lawn, are in accord with both theory and practice. Using the same construction, the finer the average yarn number the less the contraction of the filling during weaving and therefore the finer the reed required.

If Rule 9 be accepted as accurate for ordinary plain cloths, the above comparison shows that the empirical formulas (Rules 10, 11, and 12) give too fine a reed, allowing too little contraction, on coarse goods, and too coarse a reed, allowing too much contraction, on fine goods. These "rules of thumb" disregard the effect of variations in the number, and hence in the diameter, of the yarns and therefore give uncertain, and in many cases very misleading results. To find the ends per inch, and therefore the dents per

inch, in reed required to make a cloth of a specified sley and average yarn count it is safest to use Rule 9.

To find sley that would be woven with a given reed and yarn numbers:

RULE 13.—*From the square of the distance between ends in the reed, subtract the reciprocal of the yards per pound of the average yarn number. The reciprocal of the square root of their difference is the sley.*

NOTE—This rule is derived from RULE 9-A.

EXAMPLE: A wide sheeting is to be woven with 21s warp and 24s filling, using a 29 dent reed. If the average yarn number is 22.4s, how many ends per inch in the cloth produced?

ANSWER: The ends per inch in reed are $29 \times 2 = 58$. The distance between ends in the reed is therefore 1/58 and this squared is 1/3364. The average yarn number is 22.4s and this contains $22.4 \times 840 = 18{,}816$ yards to the pound. Then from Fig. 1 and explanation under Rule 9, we know that $r^2 = e^2 + d^2$. therefore $e^2 = r^2 - d^2$

$$= \frac{1}{3{,}364} - \frac{1}{18{,}816}$$

$$= \frac{18{,}816 - 3{,}364}{18{,}816 \times 3{,}364} = \frac{15{,}452}{63{,}297{,}024}$$

$$= \frac{1}{4096.36}$$

$$\text{and } e = \sqrt{\frac{1}{4096.36}} = \frac{1}{64}$$

Therefore ends per inch in cloth = 64.

Warp Length Compared With Cloth Length

To find length of warp required to produce a given length of cloth, knowing picks per inch and yarn numbers:

RULE 14.—*Square the reciprocal of the pick and add the reciprocal of the number of yards to the pound of the average yarn number. Obtain the reciprocal of the square root of their sum. Subtract this from the pick and divide by the pick to get percentage of warp contraction. The length of cloth required divided by 1 minus the percentage of warp contraction gives length of warp required.*

NOTE—The derivation of Rule 14 is similar to that of Rule 9-A, and can be illustrated by the same triangle of Fig. 1. If Fig. 1 be turned 90 degrees and the side *e* (distance between ends in the cloth) relabelled as side *p* (distance between picks in the cloth), the formula $r^2 = e^2 + d^2$ becomes $r^2 = p^2 + d^2$. In this latter formula, the side *d* continues to represent the diameter of the average yarn number but the hypotenuse *r*, instead of representing the distance between ends before filling contraction, will represent the distance there would be between picks if there were no warp contraction in the cloth. In other words, *r* will bear the same relation to *p* as the ends per inch in the reed do to the ends per inch in the cloth.

EXAMPLE: A printcloth is made with 64 ends of 30s warp and 60 picks of 39s filling. How many yards of warp required for a 60-yard cut of cloth?

ANSWER: Pick = 60. $(1/60)^2 = 1/3600$. Average yarn number is 33.8s and this has 33.8 × 840 or 28,392 yards to the pound. Then

$$r^2 = p^2 + d^2 = \frac{1}{3600} + \frac{1}{28{,}392}$$

$$= \frac{28{,}392 + 3{,}600}{28{,}392 \times 3{,}600} = \frac{31{,}992}{102{,}211{,}200} -$$

$$= \frac{1}{3194.8990}$$

$$\text{and } r = \sqrt{\frac{1}{3194.8990}} = \frac{1}{56.523}$$

The warp contraction $= \frac{60 - 56.523}{} = 5.80\%$ and $U = 1 - .058 = .942$.

The length warp required $= L' = \frac{L}{U} = \frac{60}{.942} = 63.69$ yds.

NOTE—Attempts have been made by some to formulate empirical rules for quickly ascertaining the approximate percentage of warp contraction. A rule of thumb that is often given is: "Multiply the pick by 3.5 and divide by the counts of the filling." This rule would show the warp contraction on a 48x48, 14s.14s, sheeting to be 12% whereas Rule 14 would prove it to be 8.56%, and it would show the warp contraction on a 88x80, 60s. 100s, India linon to be 2.80% whereas Rule 14 shows it to be 4.78%. This empirical rule was probably intended originally to apply only to printcloths. Let us see how it works out in this restricted field.

To find approximate warp contraction in printcloths, knowing the pick and the filling yarn number:

EMPIRICAL RULE 15.—*Divide the pick by the filling yarn number and multiply by 3.5.*

EXAMPLE: A printcloth has 60 picks of 39s filling to the inch. what is the approximate contraction of the warp?

ANSWER: $\frac{60 \times 3.5}{39} = 5.38\%$.

COMPARISON OF RULE 14 WITH EMPIRICAL RULE 15:

The relative accuracy of the results obtained by the use of Rules 14 and 15, respectively, can be illustrated by staple printcloths, as follows:

	Warp contraction.	
Printcloths.	By Rule 14.	By Rule 15.
39 ", 4.25, 72x76, 30s.37s.	8.97%	7.19%
38½", 5.15, 64x64, 30s.38s.	6.56%	5.90%
38½", 5.35, 64x60, 30s.39s.	5.80%	5.38%
39 ", 4.00, 80x80, 30s.40s.	9.55%	7.00%
39 ", 4.75, 68x72, 30s.41s.	7.84%	6.15%

In ascertaining the warp contractions above according to Rule

14, it has been assumed that the printcloths are made exactly to specifications, using 6% sizing on warp and 24 extra ends for selvages. Full particulars, including such details, are essential for the correct ascertainment of the average yarn number and, as shown in Rule 14, knowledge of this is essential for the correct ascertainment of the warp contraction. Rule 15 disregards such details and takes into consideration only the pick and the filling yarn number. If Rule 14 be accepted as accurate for ordinary plain cloths then the empirical formula (Rule 15) cannot be relied upon for accurate results even in the restricted field of printcloths. In ascertaining the warp contraction, in printcloths as in other plain-woven fabrics, it is much safer to use Rule 14, which is much simpler to operate than to state, even though a few more figures are involved, than to use empirical formulas whose results may or may not be within speaking distance of the correct answer.

To find length of warp required for a given length of special cloths such as lenos, lappets, or terry-woven towels:

Rule 16.—*Measure off a convenient length in the cloth, say* 36 *inches, and cut; take out ends of special yarns included, straighten without stretching, and remeasure. The length of the yarn out of the cloth minus the length of the yarn in the cloth, divided by the length of the yarn out of the cloth, is the warp contraction of each.*

Example: The ground threads from a yard of lappet-woven cloth, after straightening without stretching, measure 38 inches; similarly the lappet ends from a yard of cloth measure 60 inches. What was the warp contraction of each kind of yarns?

Answer: Ground ends: $(38 - 36) \div 38 = 5.26\%$ warp contraction.

Lappet ends: $(60 - 36) \div 60 = 40\%$ warp contraction.

Note—This operation has to be performed very carefully so as to get the correct original length of the yarns by taking out all of the waviness without unduly stretching. It is best to take at least 36 inches for with a short length such as 5 or 10 inches the margin of possible error would be much increased.

Contraction In Weaving Plain Cotton Cloths

Calculations for the reed required to produce a given sley and for the slasher length required to produce a given length of cut are both based on the ascertainment of the percentage of contraction or take-up in weaving. It has been shown that for any individual case Rule 9, with the derived Rule 14, will give accurate results. For the convenience of those who have to ascertain either the reed or the warp length, Table 1, based on Rule 9, has been worked out to show the contraction in warp and filling in the weaving of ordinary plain cotton cloths ranging up to 140 ends or picks per inch and up to 120s in average yarn number. It has been charted so that any intermediate set of conditions can be readily ascertained without the necessity of working out the formula given.

The contraction in weaving depends primarily on the threads per inch crossed by the yarn, warp or filling, and secondarily on the average yarn number. The size of warp and of filling yarns together affect both warp and filling contraction, so that the average yarn number is the correct basis to use. If the average yarn number is not known accurately then it is permissible to use the arithmetical average of the warp and filling yarn numbers as the margin of error in such case will usually be small.

In using the table or chart the fact should be borne in mind that the contraction of warp yarn depends most largely on the number of picks around which the warp has to bend; also that the contraction of filling yarn depends most largely on the number of warp ends around which the filling has to bend.

As an illustration of the method of using this table let us take a 39-inch, 68x72, 30s.41s, 4.75-yard printcloth. The average yarn number, as ascertained by Rule 21, is 34.8s. The warp contraction is found from the table by looking under the column headed 72 (in this case picks crossed by the warp). It is seen that for 34s average yarn number the contraction is 8.0% and for 35s it is 7.8%, therefore for 34.8s the warp contraction is, by interpolation, 7.84%. The filling contraction is found from the table by looking under the column headed 68 (in this case warp ends crossed by the filling). It is seen that for 34s average yarn number the con-

traction is 7.2% and for 35s it is 7.0%, therefore for 34.8s the filling contraction is, by interpolation, 7.04%.

Knowing the contraction in warp and in filling during weaving, the length of warp needed and the reed required are easily obtained. For a 60-yard cut of the cloth there is needed 60 divided by 1 minus 7.84%, which is 60 divided by .9216, or 65.1 yards warp from the slasher. The reed required would have 68 (sley) multiplied by .9296 (1 minus 7.04%) divided by 2 (ends per dent), or 31.60 dents per inch. If the reed width is 44½ inches, then it would be ordered with 44.5 × 31.60, or 1406 dents spread on 44½ inches.

Average Yarn Number

The ascertainment of the average yarn number in a cloth is a matter of prime importance as this factor is necessary as a basis for making or proving various other calculations dealing with cloth. The number of 840-yard hanks of yarn that weigh one pound is the number or count of a yarn, therefore the number of 840-yard hanks of yarn contained in one pound of cloth, with sizing deducted, is the average yarn number in the cloth. In both instances the number is based on the yarn in the unsized condition.

The average yarn number in a cloth is rarely the same as the arithmetical average of the warp and filling yarn numbers; it is usually coarser by reason of there being a larger proportion of the coarser than of the finer yarns involved. For instance, if a cloth is made with 60s warp and 100s filling the arithmetical average would be 60 plus 100, divided by 2, which would give 80s. Taking into consideration the relative weights and contractions of the warp and filling yarns, the average yarn number is more likely to be around 74s.

The basic formula in cotton cloth calculations is

FORMULA 1: $AC = BYT$

where A = Average yarn number.

C = Cloth constant that allows for contraction of yarns in weaving and for weight added to yarns by sizing.
B = Breadth (width) of cloth, in inches.
Y = Yards (linear) of cloth per pound.
T = Total single threads per square inch.

The above is an exact equation as each side of the equation represents the number of yards of yarn (the effective yarn length) that weigh one pound. The English cotton yarn numbering system is based on the number indicating the number of 840-yard hanks that weigh one pound, so the yarn number times 840 equals yards of yarn per pound. If there were no contraction or sizing then C would equal 840. Under actual conditions, C, a length of yarn, as measured in the cloth, that weighs the same as a hank of the yarn as spun, must always be less than 840 by reason of the contraction and sizing. Under all circumstances the average yarn

number A, multiplied by the cloth constant C, will represent the number of yards of yarn that weigh one pound. T, which is the sum of the number of single threads of warp and filling in one square inch, necessarily represents the inches of yarn as measured in one square inch of the cloth; this multiplied by B, the cloth width, equals the inches of yarn in one linear inch of cloth of that width or the number of yards of yarn in one linear yard of cloth; this in turn multiplied by Y, the linear yards of cloth per pound, equals the yards of yarn in one pound of the cloth. Therefore AC represents yards of yarn to the pound, and BYT represents yards of yarn to the pound, and consequently AC = BYT.

To find the average yarn number in a cloth when width, weight, sley and pick, and cloth constant are known:

RULE 17: *Multiply width of cloth in inches by yards per pound and by total threads per square inch; divide product by suitable cloth constant that allows for contraction and sizing.*

The above may be expressed, by transposition of the basic Formula 1, as

FORMULA 2: $A = \frac{BYT}{C}$

EXAMPLE 1: A heavy sheeting is made 36 inches, 48x48, 3 yds. per lb. If the cloth constant is 740, what is the average yarn number?

ANSWER: $A = \frac{BYT}{C} = \frac{36 \times 3 \times 96}{740} = \frac{10{,}368}{740} = 14s$

average yarn number.

EXAMPLE 2: A printcloth is made 38½ inches, 64x60, 5.35 yds. per lb. If the cloth constant is 756, what is the average yarn number?

ANSWER: $A = \frac{BYT}{C} = \frac{38.5 \times 5.35 \times 124}{756} = \frac{25{,}541}{756} =$

33.8s average yarn number.

EXAMPLE 3: An India linon is made 30 inches, 88x80, 11.35 yds. per lb. If the cloth constant is 775, what is the average yarn number?

ANSWER: $A = \frac{BYT}{C} = \frac{30 \times 11.35 \times 168}{775} = \frac{57{,}204}{775} =$

73.8s average yarn number.

NOTE—In the above examples the weight was stated in linear yards per pound but it might have been stated in square yards per pound, in ounces per linear yard, or in ounces per square yard, therefore to fit any case the formula may be stated as

$$A = \frac{BYT}{C} = \frac{36ST}{C} = \frac{16BT}{CZ} = \frac{576T}{CZ'}$$

To find the average yarn number in a cloth when warp and filling yarn numbers and weights are known:

RULE 18.—*Multiply the warp yarn number by the weight of the warp (unsized) and the filling yarn number by the weight of the filling. Add the products and divide by the sum of the two weights.*

EXAMPLE: A linear yard of printcloth contains .1048 lb. of 30s yarn, .0063 lb. of sizing, and .0754 lb. of 39s filling. What is the average yarn number?

ANSWER:

30 × .1048 =	3.144	(rel. wt. warp yarn, unsized)
39 × .0754 =	2.9406	(rel. wt. filling yarn)
.1802)	6.0846	
	33.77s	average yarn number.

NOTE—This rule gives absolutely exact results. The sizing, although it affects the weight of the cloth, does not affect the average yarn number and can therefore be disregarded when the weights of the unsized yarns are known. If the warp yarn, sizing. and filling yarn were stated in percentages of the cloth weight, instead of in pounds, the same result would be obtained by the following rule.

To find average yarn number in a cloth when warp and filling yarn numbers and percentages are known:

RULE 18-A.—*Multiply the warp yarn number by the percentage of warp (unsized) and the filling yarn number by the percentage of filling. Add the products and divide by the sum of the two percentages.*

EXAMPLE: A printcloth is made of 30s warp and 39s filling. The warp yarn (unsized) constitutes 56.19%, the sizing 3.38%, and the filling 40.43%, of the weight of the cloth. What is the average yarn number?

ANSWER:

$30 \times .5619 = 16.857$ (rel. wt. warp yarn, unsized)

$39 \times .4043 = 15.768$ (rel. wt. filling yarn)

$.9662 \;)\; 32.625$

33.77s average yarn number.

To find average yarn number in a cloth when width, weight, sley and pick, and percentages of contraction and sizing are known:

RULE 19.—*Divide total ends in warp by 1 minus percentage of warp contraction and add percentage for sizing. Multiply cloth width by picks per inch and divide by 1 minus percentage of filling contraction. Add foregoing lengths of warp and filling; multiply by yards per pound and divide by 840.*

EXAMPLE: A longcloth that is used in collar and shirt manufacture is woven 39 inches, 96x100, 4.15 yards per pound. Warp contraction 11.9%, sizing on warp 8%, filling contraction 10.4%. What is the average yarn number?

NOTE—Inasmuch as no data are given as to warp and filling yarn numbers or weights, and the cloth weight includes the sizing on the warp, it is necessary in this case to treat the latter as yarn.

ANSWER: Total ends in warp $= 39 \times 96 = 3{,}744 + 24$ (extra selvage ends) $= 3{,}768$. $U = 1 - .119 = .881$, and $V = 1 - .104 = .896$.

$$\frac{3{,}768 \times 1.08}{.881} = 4{,}619$$ yards of warp in a yard of cloth, treating the sizing as warp.

$$\frac{39 \times 100}{.896} = 4{,}353$$ yards of filling in a yard of cloth.

Then $4{,}619 + 4{,}353 = 8{,}972$ yards of warp and filling in one linear yard of cloth.

$$\frac{8{,}972 \times 4.15}{840} = \frac{37{,}234}{840} = 44.32\text{s}$$ average yarn number.

To find average yarn number in a cloth when sley, pick, warp yarn, filling yarn, and contraction percentages are known:

RULE 20.—*Divide sley by 1 minus percentage of warp contraction; divide pick by 1 minus percentage of filling contraction; add*

the two quotients to obtain total length of yarn used. Divide length of warp used by warp yarn number and length of filling used by filling yarn number; add the two quotients to obtain total weight of yarn used. Divide total length of yarn by total weight of yarn.

EXAMPLE: A 96x100 longcloth is made of 40s warp and 50s filling. Warp contraction 11.9%, filling contraction 10.4%. What is the average yarn number?

ANSWER: U = 1 — .119 = .881 and V = 1 — .104 = .896.

$$\frac{E}{U} + \frac{P}{V} = \frac{96}{.881} + \frac{100}{.896} = 108.96 + 111.61 = 220.57 \text{ inches}$$

of yarn required to make a square inch of the cloth or 220.57 yards of yarn required to make a square yard of the cloth.

Then

108.96 ÷ 40s =	2.724	(rel. wt. warp yarn, unsized)
111.61 ÷ 50s =	2.2322	(rel. wt. filling yarn)
220.57 ÷	4.9562 = 44.50s average yarn number.	

NOTE—The above is based on the fact that the length divided by the yarn number times 840 is equivalent to the weight, and that the length divided by the weight is equivalent to the yarn number times 840. The sley and pick represent inches of yarn in a square inch, as measured in the cloth, and allowing for contraction, represent inches of yarn used to produce a square inch of cloth. As they represent the inches of yarn in a square inch or the yards of yarn in a square yard, the lengths 108.96 and 111.61 may be considered as hanks and 840, the yards per hank, are therefore omitted from the calculations. Rule 20 gives the correct average yarn number in a square inch or square yard of the body of the cloth but does not take into account the extra ends in the selvage; in most instances, however, these constitute too small a proportion of the total length of yarn used to appreciably affect the result. The following rule, which is more largely used than any other in obtaining the average yarn number, gives fairly approximate results and is very useful in cases where the yarn contractions are unknown.

To find approximate average yarn number in a cloth when sley, pick, warp yarn, and filling yarn are known:

RULE 21.—*Divide sley by warp yarn number, and pick by filling yarn number. Add the two quotients and divide into sum of sley and pick.*

EXAMPLE: A 96x100 longcloth is made of 40s warp and 50s filling. What is the average yarn number?

ANSWER:

96 ÷ 40s = 2.40		(relative wt. warp yarn, unsized)
100 ÷ 50s = 2.00		(relative wt. filling yarn)
196 ÷	4.40 = 44.55s average yarn number.	

NOTE—This rule assumes that the yarn lies in the cloth in a straight line, in other words that the length of the yarn used and the length of the cloth produced therefrom are the same. The average yarn number as thus obtained is therefore listed as approximate but if the warp contraction and the filling contraction are not materially different it gives results very close to the actual.

Using symbols, Rule 21 can be more clearly shown and reduced to a slightly different form, thus:

$$A = \frac{T}{\left(\frac{E}{W} + \frac{P}{F}\right)} = \frac{T}{\left(\frac{EF + PW}{W \times F}\right)} = \frac{TWF}{EF + PW}$$

Using this formula we can restate the preceding rule in this way:

RULE 21-A: *Multiply sley by filling yarn number and pick by warp yarn number. Add the results and divide into the product of the total single threads per square inch times the warp yarn number times the filling yarn number.*

EXAMPLE: (Same as for Rule 21).

ANSWER:

$$A = \frac{TWF}{EF + PW} = \frac{196 \times 40 \times 50}{(96 \times 50) + (100 \times 40)} =$$

$$\frac{392{,}000}{4{,}800 + 4{,}000} = \frac{392{,}000}{8{,}800} = 44.55\text{s}.$$

It is seen that Rules 21 and 21-a give the same result, which they should do as they are the same rule stated in different ways. The advantage of Rule 21-a over Rule 21 is that there is only one, instead of three, divisions required, and the possibility of errors in computation is thereby lessened.

For cloths made in square construction, that is, with an equal

number of ends and picks per square inch, the above rule can be still further shortened as follows:

RULE 21-B: *Multiply the warp yarn number by the filling yarn number and divide by the warp yarn number plus the filling yarn number; multiply quotient by 2.*

EXAMPLE: A printcloth is made 80x80, 30s.40s. What is the average yarn number?

ANSWER:

$$A = \frac{2WF}{W + F} = \frac{2 \times 30 \times 40}{30 + 40} = \frac{2400}{70} = 34.29\text{s.}$$

To find average yarn number in a cloth containing more than one number of warp or filling, when ends and picks of each yarn number are known:

RULE 22: *Divide average sley by average warp yarn number. Divide number of single threads of filling in an inch by average filling yarn number. Add the quotients and divide into the sum of the average sley and pick.*

NOTE—This rule is based on Rule 21. In finding the average sley, average pick, and average yarn number, it is necessary to first reduce all ply yarns to equivalent single yarns.

EXAMPLE: A mercerized corded check is woven 36 inches wide, using 2736 ends of 70/1 plain and 432 ends of 10/2 mercerized; and having 76 picks of 90/1 plain and 8 picks of 24/2 mercerized, to the inch. What is the average yarn number?

ANSWER:

432 ends of 10/2 = 864 single threads of 10s.
864 + 2736 = 3600 single threads in warp.
3600 ÷ 36 inches = 100 average sley.
864 ÷ 10s = 86.40
2736 ÷ 70s = 39.09

3600 ÷ 125.49 = 28.69 average warp yarn number.
8 picks of 24/2 = 16 single threads of 24s.
16 + 76 = 92 single threads of filling in an inch.
16 ÷ 24s = .667
76 ÷ 90s = .844

92 ÷ 1.511 = 60.89 average filling yarn number.

Then:

100 average sley divided by 28.69 average warp yarn number = 3.485

92 single threads of filling divided by 60.89 average filling yarn number =1.511

192 total single threads of yarn in square inch divided by 4.996

= 38.43s average yarn number in cloth.

To find average yarn number in a cloth containing more than one number of warp or filling yarn, when ends and picks of each yarn number are known:

RULE 23: *Divide the average number, per inch, of single threads of each kind of yarn by its yarn number; add the quotients and divide into total threads per square inch.*

NOTE—This is an abbreviation of Rule 22.

EXAMPLE: (Same as for Rule 22.)

ANSWER: This mercerized corded check averages 24 single threads of 10s warp and 76 single threads of 70s warp to the inch; it has 16 single threads of 24s filling and 76 single threads of 90s filling to the inch.

Then:

24 ÷ 10s = 2.400
76 ÷ 70s = 1.086
16 ÷ 24s = .667
76 ÷ 90s = .844

192 ÷ 4.997 = 38.43s average yarn number.

The Cloth Constant

In cloth calculations there is an appreciable saving of time and effort in using a constant that automatically allows for contraction in width from reed to cloth, for contraction in length from slasher to cloth, and for the addition of sizing to the warp. The "cloth constant" is frequently stated as 756 or 764, and apparently no book on textile calculations shows how these constants are obtained or under what conditions they are correct. We propose to show the theory underlying this matter so that, knowing the particulars in regard to the cloth under consideration and the conditions under which it is woven, any one can figure out the correct cloth constant.

At the start, it may be noted that the term "constant" does not mean constant for all conditions but constant only for a particular set of conditions. Cloth constants actually used vary from less than 700 up to over 800, although for ordinary plain cloths they are mostly between 725 and 775.

The "cloth constant" is based on the hank of 840 yards and represents a length of yarn, as measured in the cloth, that is equivalent in weight to a hank of the average of warp and filling counts before sizing or weaving.

In figuring the cloth constant it is usual to consider the take-up or contraction in length of yarn during weaving and the addition of sizing as having the same effect, as either results in the yarn in the cloth measuring less to the pound than the same yarn as spun. For instance, using 30s warp, we know that it measures 840 $\times$ 30, or 25,200 yards to the pound. If it takes up 10% in weaving it occupies a length in the cloth of 25,200 $\times$ .90 or 22,680 yards; 22,680 divided by 840 equals 27s so that after take-up 30s may be considered as 27s. 30 — 10% = 27s. If the 30s was sized 10% it would be very slightly finer than 27s. If the 30s was sized 5% and the take-up in weaving was 5%, the equivalent count in the cloth would also approximate very close to 27s. In any one of these three cases we could, for cloth calculation purposes, disregard contraction and sizing, and figure on 27s instead of 30s or, to put it another way, figure that each hank had contracted 10% and therefore measured 756 yards instead of 840 yards.

To obtain a constant that will allow for contraction and sizing, so that in cloth calculations these may be disregarded and the yarn considered as lying in the cloth in a straight line and unsized, it is necessary to know the percentages of warp and of filling in the cloth, in addition to the contraction in width, the contraction in length, and the percentage of sizing added to the warp.

The constant 764 is primarily based on the assumption that there is 6% contraction from reed to cloth, 6% contraction from slasher length to cloth length, and 6% sizing added to the warp, also that the weight of filling and of sized warp in the cloth are the same. If the filling contracts 6% then a hank of 840 yards will measure in the cloth a distance equal to 840 × .94 or 789.6 yards. If the warp contracts 6% a hank also measures 840 × .94 or 789.6 yards in the cloth, but it is also sized 6% and this, for cloth calculation purposes, may be considered as having the same effect as contraction. 6% + 6% = 12%. 1 — 12% = .88. Then 840 × .88 = 739.2. On the assumption that warp and filling each account for 50% of the weight of the cloth, we then obtain the cloth constant as follows:

Warp = 840 × .88 × .50 = 369.6
Filling = 840 × .94 × .50 = 394.8

Cloth constant = 764.4, say 764.

An idea of the range of cloth constants to be expected can be obtained by assuming the weight of warp and of filling in the cloth to be the same and figuring out the results with some normal variations in contraction and sizing. For instance the following may be taken as representative:

Pct. of sized warp.	Pct. of filling.	Warp contraction.	Sizing on warp.	Filling contraction.	Cloth constant.
50%	50%	10%	7%	10%	727
50%	50%	9%	7%	9%	735
50%	50%	8%	7%	8%	743
50%	50%	7%	7%	7%	752
50%	50%	7%	6%	7%	756
50%	50%	6%	6%	6%	764
50%	50%	5%	5%	5%	777
50%	50%	4%	4%	4%	790

Some mills use the constant 735 for heavy sheetings, 745 for sheetings, 756 for printcloths, and 775 for India linons, and obtain fairly approximate results. The exact constant will vary according to any variation in the relative percentages of warp and

filling, in the percentage of contraction in width or in length, or in the percentage of sizing added to the warp.

The percentages of warp and filling are rarely exactly the same so we shall first put the result of the above analysis as a rule and then give a few examples illustrative of the cloth constants that would be obtained for typical standard cloths.

To find the cloth constant, knowing percentages of warp and filling, of warp contraction and filling contraction, and of sizing on warp:

RULE 24.—*Multiply 840 by 1 minus percentages of warp contraction and sizing and by the percentage of sized warp in the cloth. Multiply 840 by 1 minus percentage of filling contraction and by the percentage of filling in the cloth. The sum of the two products is the cloth constant to be used to allow for contraction and sizing.*

EXAMPLE 1: An osnaburg, for bag making, is woven 30 inches, 38x30, 8½s.5s., 7 ounces per yard (2.28 yards per pound). Warp 45.2%, filling 54.8%. Warp contraction 7.35%, filling contraction 10.75%, sizing on warp 12½%. What is the cloth constant?

ANSWER:

Warp: $840 \times .8015 \times .452 = 304.31$
Filling: $840 \times .8925 \times .548 = 410.84$

Cloth constant = 715.15, say 715.

EXAMPLE 2: A heavy sheeting is woven 36 inches, 48x48, 14s.14s, 3 yds. per lb. Warp 51.8%, filling 48.2%. Warp contraction 8.56%, filling contraction 8.56%, sizing on warp 6%. What is the cloth constant?

ANSWER:

Warp: $840 \times .8544 \times .518 = 371.77$
Filling: $840 \times .9144 \times .482 = 370.22$

Cloth constant = 741.99, say 742.

EXAMPLE 3: A sheeting is woven 36 inches, 56x60, 21s.24s, 4 yds. per lb. Warp 53.6%, filling 46.4%. Warp contraction 8.37%, filling contraction 7.40%, sizing on warp 6%. What is the cloth constant?

ANSWER:

Warp: $840 \times .8563 \times .536 = 385.54$
Filling: $840 \times .9260 \times .464 = 360.92$

Cloth constant = 746.46, say 746.

EXAMPLE 4: A printcloth is woven 38½ inches, 64x60, 30s.39s, 5.35 yds. per lb. Warp 59.6%, filling 40.4%. Warp contraction 5.80%, filling contraction 6.52%, sizing on warp 6%. What is the cloth constant?

ANSWER:

Warp: $840 \times .8820 \times .596 = 441.56$

Filling: $840 \times .9348 \times .404 = 317.23$

Cloth constant = 758.79, say 759.

EXAMPLE 5: A carded lawn is woven 40 inches, 72x68, 40s.50s, 6 yds. per lb. Warp 58.4%, filling 41.6%. Warp contraction 5.69%, filling contraction 6.31%, sizing on warp 6%. What is the cloth constant?

ANSWER:

Warp: $840 \times .8831 \times .584 = 433.21$

Filling: $840 \times .9369 \times .416 = 327.39$

Cloth constant = 760.60, say 761.

EXAMPLE 6: An India linon is woven 40 inches, 88x80, 60s. 100s, 8.50 yds. per lb. Warp 65.7%, filling 34.3%. Warp contraction 4.78%, filling contraction 5.70%, sizing on warp 4½%. What is the cloth constant?

ANSWER:

Warp: $840 \times .9072 \times .657 = 500.67$

Filling: $840 \times .9430 \times .343 = 271.69$

Cloth constant = 772.36, say 772.

EXAMPLE 7: A combed lawn is woven 40 inches, 84x80, 80s. 100s, 10.50 yds. per lb. Warp 58.0%, filling 42.0%. Warp contraction 4.04%, filling contraction 4.43%, sizing on warp 5%. What is the cloth constant?

ANSWER:

Warp: $840 \times .9096 \times .580 = 443.16$

Filling: $840 \times .9557 \times .420 = 337.17$

Cloth constant = 780.33, say 780.

EXAMPLE 8: An organdie is woven 40 inches, 88x84, 100s.140s, 13.10 yds. per lb. Warp 59.8%, filling 40.2%. Warp contraction 3.43%, filling contraction 3.75%, sizing on warp 4%. What is the cloth constant?

ANSWER:

Warp: $840 \times .9257 \times .598 = 465.00$

Filling: $840 \times .9625 \times .402 = 325.02$

Cloth constant = 790.02, say 790.

To find cloth constant, knowing width, linear yards per pound, sley and pick, and average yarn number:

RULE 25.—*Multiply width in inches by yards per pound and by total single threads per square inch; divide product by average yarn number.*

The above may be expressed, by transposition of the basic Formula 1, as

FORMULA 3: $C = \frac{BYT}{A}$

EXAMPLE: A typewriter cambric is woven 39 inches, 126x156, 6.10 yds. per lb. Average yarn number is 92s. What is the cloth constant?

ANSWER:

$$C = \frac{BYT}{A} = \frac{39 \times 6.10 \times 282}{92} = 729 \text{ cloth constant.}$$

NOTE—In the above examples the weight was stated in linear yards per pound but it might have been stated in square yards per pound, in ounces per linear yard, or in ounces per square yard, therefore to fit any case the formula may be stated as

$$C = \frac{BYT}{A} = \frac{36ST}{A} = \frac{16BT}{AZ} = \frac{576T}{AZ'}$$

Construction Calculations

The number of warp ends and of filling picks per square inch, that is, the sley and the pick, are often referred to as the "construction" of the cloth.

Staple plain cloths with a large number of ends per inch are made with fine yarns, and the coarser the yarn the fewer threads used per square inch. The same yarns may be used in different constructions, however, according to the openness of the fabric desired. There is a limit, depending on the diameter of the yarn, to the number of ends per inch that can be used but the fabric can be made as open as desired and in some instances fine yarns are used in very coarse constructions.

In plain cloths for ordinary purposes it is usually found best to have the sley and pick approximate to secure best results. In the United States it is customary to have the sley slightly exceed the pick. In England it would seem that the contrary is the case, that there are usually slightly more picks than ends. If the sley and pick are the same the cloth is said to have a "square" construction. There are certain constructions for certain goods that are more or less standard in each country. For instance, in the United States the typical construction for coarse sheeting is 48 square (48 ends and 48 picks per square inch), but sheetings of different qualities are made from as coarse as 40x40 up to 72x72. The typical print cloth construction is 64 square, though subcount prints may be as open as 48x48 in some cases, while fine prints may run up to 88x88 or even above. Some tobacco cloths are made in constructions as coarse as 8x8 ends per square inch while some imported transparent Swiss organdies or fine French lawns, for women's collars, come in constructions as fine as 180x180. The first has 16 and the latter 360 threads per square inch; these probably mark the limits in staple plain cloths.

In passing it may be noted that while canvas and duck have comparatively coarse constructions they probably average finer in construction as compared with the size of their yarns than any other type of cloths. In some instances they have as many ends in the warp as the count of the yarn would permit to be contained in an inch if laid side by side without any filling; they are packed

together so tight in weaving on a heavy loom that there are practically no interstices between the yarns, and the cloth therefore has a board-like feel.

It may also be noted that special fabrics often have more threads per inch than are here noted for plain cloths. For instance, an imported English pique vesting, made with filling back and filling stuffing, has been found on examination to have over 800 threads per square inch. Even plain-woven cloths, if for special purposes, may be far from having approximately the same number of ends and picks per inch, for instance a typical "cord fabric" that is one of the several types of cloths that are used in various parts of an automobile tire, has 2½ picks per inch to 26½ ends per inch. This study, however, is confined mainly to staple plain cloths of large consumption and peculiar specialties may be disregarded.

To find the total threads per square inch, knowing all other particulars:

RULE 26: *Multiply average yarn number by cloth constant; divide product by width in inches and by yards per pound.*

The above may be expressed, by transposition of the basic formula 1, as

FORMULA 4: $$T = \frac{AC}{BY}$$

EXAMPLE: A printcloth is to be made 38½ inches wide, to weigh 5.35 yards per pound, from 30s warp and 39s filling. Average yarn number 33.8 and cloth constant 756. What would be total threads per square inch necessary?

ANSWER:

$$T = \frac{AC}{BY} = \frac{33.8 \times 756}{38.5 \times 5.35} = 124 \text{ threads per square inch.}$$

Knowing the usual constructions for printcloths we would naturally make this cloth with 64 warp ends and 60 picks per inch.

NOTE—For use in cases where the weight is stated in different terms this formula may be stated as

$$T = \frac{AC}{BY} = \frac{AC}{36S} = \frac{ACZ}{16B} = \frac{ACZ'}{576}$$

Width Calculations

Woven goods of 12 inches and under are known as narrow fabrics and are made on narrow-ware or ribbon looms that weave several at a time with the aid of rack-and-pinion controlled shuttles. Cloth over 12 inches wide is usually made on a fly-shuttle loom.

Cloth widths run from 13 inches up to wide sheeting widths of 108 inches; a small amount is made for special purposes in even wider widths. The width is usually stated in inches but for wide sheeting is often expressed in quarters of a yard (9 inches), thus we see quotations on 6/4 (this is 54 inches and known as six-quarter) sheeting up to 12/4 or 108 inch sheeting. Sometimes this system is used for widths less than 50 inches, for instance 4/4 being used in place of 36 inches, or even 3/4 in place of 27 inches.

Ordinary staple cloths are mostly 25 to 45 inches wide, probably the bulk falling within the range of 36 to 40 inches. It may be noted that in many clothing fabrics there has been a tendency towards somewhat wider widths which entail less waste in cutting. For instance, the standard width of ginghams was 32 inches but is now 36 inches. For printcloths the standard width for many years was 28 inches (the market leader being the 28-inch, 7 yd., 64x64) but it is now 38½ inches (the market leader being the 38½-inch, 5.35 yd., 64x60). The advent of sanforizing in addition to bleaching has resulted in 38½ and 39-inch printcloths finishing less than the minimum 36-inch width demanded by the cutters; to meet this situation some mills have shifted to 40-inch gray widths, using the same yarns and the same number of ends on the warp beam but with slightly coarser constructions. For instance, some mills making the 39-inch, 4 yd., 80x80 printcloth are shifting to the 40-inch, 4 yd., 78x78 printcloth in order to give the shirtmakers and others a finished fabric (bleached and sanforized) that will be at least 36 inches wide. The wider gray width necessitates in many cases a wider loom, say a 42- to 46-inch in lieu of a 40-inch.

Looms are ordinarily known by the width of the cloth that can be woven on them and in order to allow for contraction the reed

space is therefore usually four or five inches wider than the nominal width named. For instance a 40-inch loom is one intended for weaving cloth up to the 40-inch width and therefore usually has a reed space of 44 to 45 inches. In the most recent high-speed automatics, using longer shuttles, the overall reed space of the 40-inch loom is increased to 45¼ or 46⅞ inches; the variation is for single or double fork.

To find width of cloth to correspond with other particulars stated:

RULE 27: *Multiply average yarn number by cloth constant; divide product by total threads per square inch and by linear yards per pound.*

The above may be expressed, by transposition of the basic formula 1, as

FORMULA 5: $B = \frac{AC}{YT}$

EXAMPLE: A cotton broadcloth shirting is to be made with 144 ends of 100/2 warp and 76 picks of 100/2 filling. Weight desired is 4.50 yards per pound. Average yarn number is 100 and cloth constant is 742½. What would be the width of the cloth?

ANSWER:

$$B = \frac{AC}{YT} = \frac{100 \times 742.5}{4.50 \times 440} = 37\tfrac{1}{2} \text{ inches.}$$

RELATION OF CLOTH WIDTH AND WEIGHT

If the warp and filling yarns, also the sley and pick, are maintained the same then the width times the weight is constant.

To find weight corresponding to a new width, yarns and construction being unchanged:

RULE 28: *Multiply present width and weight together for a constant. Divide this constant by any desired width and the quotient will be the corresponding weight.*

EXAMPLE: A 36-inch, 64x68, 21s.24s, sheeting weighs 3.50 yards. What would be the weight of identical cloth in other usual widths?

ANSWER: $36 \times 3.50 = 126$. Dividing this constant by various widths we get corresponding weights in yards per pound as follows:

30	inch	width	weighs	4.20	yards	per	pound.
32	"	"	"	3.94	"	"	"
34	"	"	"	3.71	"	"	"
36	"	"	"	3.50	"	"	"
38	"	"	"	3.32	"	"	"
40	"	"	"	3.15	"	"	"
42	"	"	"	3.00	"	"	"
45	"	"	"	2.80	"	"	"
48	"	"	"	2.62	"	"	"
54	"	"	"	2.33	"	"	"
63	"	"	"	2.00	"	"	"
72	"	"	"	1.75	"	"	"
81	"	"	"	1.55	"	"	"
90	"	"	"	1.40	"	"	"
99	"	"	"	1.27	"	"	"
108	"	"	"	1.17	"	"	"

Weight Calculations

In the United States the weight of cotton cloth is usually stated in terms of the linear yards that weigh one pound. Heavy goods such as duck and tire fabrics are more conveniently stated in terms of ounces per yard, in order to avoid fractions. The English use an entirely different system from either of these, as they usually state the weight in terms of pounds per piece of so many yards. For certain purposes the cloth weight is stated in terms of square yards to the pound; this system has also been used in tariff laws.

Let Y = Yards (linear) per pound.
Z = Ounces per linear yard.
Z' = Ounces per square yard.
S = Square yards per pound.
L = Length of cloth, in yards.

To find weight in linear yards per pound, knowing ounces per linear yard:

RULE 29: *Divide 16 (ounces to pound) by ounces per linear yard.*

EXAMPLE: A tent duck weighs 10 ounces per linear yard. What is the weight in yards per pound?

ANSWER: $Y = \frac{16}{Z} = \frac{16}{10} = 1.6$ yards per lb.

NOTE—In the same way yards per pound can be changed to ounces per yard by dividing 16 by the yards per pound.

To find weight in square yards per pound, knowing linear yards per pound:

RULE 30: *Multiply width in inches by yards per pound and divide by 36.*

EXAMPLE 1: A 38½-inch print cloth measures 5.35 linear yards per pound. How many square yards to the pound?

ANSWER: $S = \frac{BY}{36} = \frac{38.5 \times 5.35}{36} = 5.72$ square yds. per lb.

EXAMPLE 2: A 27-inch printcloth measures 7.85 linear yards per pound. How many square yards to the pound?

ANSWER: $S = \frac{BY}{36} = \frac{27 \times 7.85}{36} = 5.89$ square yards per lb.

NOTE—In the same way, square yards to the pound times 36, divided by the width, gives linear yards per pound.

To find weight in pounds per cut, knowing yards per pound:

RULE 31: *Divide length of cut in yards by the yards per pound.*

EXAMPLE: What is weight of a 40-yard cut of 2.85-yard drill?

ANSWER: $\frac{L}{Y} = \frac{40}{2.85} = 14$ pounds per cut.

To find weight in yards per pound, knowing weight in pounds per piece:

RULE 32: *Divide yards per piece by weight of piece in pounds.*

EXAMPLE: The standard English gray shirting is known as the "8¼-lb. shirting" and weighs 8¼ pounds to the piece of 38 yards. What is the weight in yards per pound?

ANSWER: $Y = \frac{38}{8\frac{1}{4}} = 4.61$ yards per pound.

To find weight of cloth in yards per pound, knowing all other particulars:

RULE 33: *Multiply the average yarn number by cloth constant; divide the product by the width in inches and by the total single threads per square inch.*

The above may be expressed by transposition of the basic formula 1, as

FORMULA 6: $Y = \frac{AC}{BT}$

EXAMPLE: A printcloth is made 38½ inches, 64x64, 30s.38s. Average yarn number is 33.6, and cloth constant 756. What is weight in yards per pound?

ANSWER: $Y = \frac{AC}{BT} = \frac{33.6 \times 756}{38.5 \times 128} = 5.15$ yds. per lb.

To find weight of cloth in yards per pound, knowing all other particulars:

RULE 34: *Divide the sley by the warp yarn number; divide the pick by the filling yarn number; add the quotients and multiply by the width. Divide the cloth constant by the result.*

The above may be expressed as follows:

$$Y = C \div B \left(\frac{E}{W} + \frac{P}{F} \right)$$

EXAMPLE: A printcloth is made 38½ inches, 64x64, 30s.38s. Cloth constant 756. What is weight in yards per pound?

ANSWER:

$$Y = 756 \div 38.5 \left(\frac{64}{30} + \frac{64}{38} \right) =$$

$$\frac{756}{38.5 \times 3.817} = 5.15 \text{ yards per pound.}$$

SUMMARY—For convenient reference there are grouped below some of the main formulas for obtaining cloth weights in different terms:

$$Y = \frac{16}{Z} = \frac{36S}{B} = \frac{576}{BZ'} = \frac{AC}{BT}$$

$$S = \frac{16}{Z'} = \frac{BY}{36} = \frac{16B}{36Z} = \frac{AC}{36T}$$

$$Z = \frac{16}{Y} = \frac{BZ'}{36} = \frac{16B}{36S} = \frac{16BT}{AC}$$

$$Z' = \frac{16}{S} = \frac{36Z}{B} = \frac{576}{BY} = \frac{576T}{AC}$$

Percentages Of Warp, Filling And Sizing

To find weight of filling yarn in a linear yard of cloth, knowing all particulars:

RULE 35: *Multiply width in reed by picks per inch; divide product by the filling yarn number and by 840.*

EXAMPLE: A printcloth is woven 39 inches, 72x76, 30s.37s, 4.25 yds. per lb. What is weight of filling per linear yard of cloth?

ANSWER: By Rule 21-a, the average yarn number =

$$A = \frac{TWF}{EF + PW} = \frac{148 \times 30 \times 37}{72 \times 37 + 76 \times 30} = 33.229, \text{ say } 33.25\text{s.}$$

The filling contraction is found from Table 1 ("Percentages of Yarn Contraction in Weaving Plain Cotton Cloths") by looking under the column headed 72 (in this case warp ends crossed by the filling). It is seen that for 33s average yarn number the contraction is 8.2% and for 34s it is 8.0%, therefore for 33¼s the filling contraction is, by interpolation, 8.15%. V = 1 — 8.15% = .9185. The cloth width, 39 inches, divided by .9185, gives width of warp in reed as 42.46 inches.

Then the weight of filling in a linear yard =

$$\frac{B' \times P}{F \times 840} = \frac{42.46'' \times 76 \text{ picks}}{37\text{s} \times 840} = .1038 \text{ lb.}$$

The above rule can be restated in slightly different form as follows:

RULE 35-A: *Multiply width of cloth by picks per inch; divide product by 1 minus filling contraction, by the filling yarn number, and by 840.*

Using the same example as above we then find the weight of filling in a linear yard to be:

$$\frac{B \times P}{V \times F \times 840} = \frac{39'' \times 76 \text{ picks}}{.9185 \times 37\text{s} \times 840} = .1038 \text{ lb.}$$

To find weight of warp (unsized) in a linear yard of cloth, knowing all particulars:

RULE 36: *Divide total ends in warp by 1 minus warp contraction, by the warp yarn number, and by 840.*

EXAMPLE: (As above). What is the weight of warp (unsized) per linear yard of cloth?

ANSWER: Total ends in warp = 39 (inches) × 72 (sley) = 2808 plus 24 extra selvage ends = 2832. The warp contraction is found from Table 1 by looking under the column headed 76 (in this case picks crossed by the warp). It is seen that for 33s average yarn number the contraction is 9.0% and for 34s it is 8.8%, therefore for 33¼s the warp contraction is, by interpolation, 8.95%. U = 1 — 8.95% = .9105.

Then the weight of unsized warp in a linear yard =

$$\frac{\text{Total ends in warp}}{U \times W \times 840} = \frac{2832}{.9105 \times 30s \times 840} = .1234 \text{ lb.}$$

To find weight of sizing in a linear yard of cloth, knowing all particulars:

RULE 37: *Add weight of filling, ascertained by Rule 35-a, to weight of unsized warp, ascertained by Rule 36, and subtract from weight of cloth in pounds per linear yard.*

EXAMPLE: (As above). What is the weight of sizing per linear yard of cloth?

ANSWER: A linear yard of the cloth weighs $\frac{1}{4.25}$ = .2352 lb.

Weight of filling plus weight of unsized warp = .1038 + .1234 = .2272 lb. Weight of sizing per linear yard is therefore .2352 — .2272 = .0080 lb.

To find percentages of filling, of unsized warp, and of sizing in a linear yard of cloth, having the respective weights:

RULE 38: *Divide weight of filling, of unsized warp, and of sizing, by total weight of cloth in pounds per linear yard.*

EXAMPLE: (As above). What are the percentages of filling, of unsized warp, and of sizing, per linear yard?

ANSWER: As a linear yard of the cloth weighs .2352 lb. and the filling weighs .1038 lb., the filling constitutes .1038 divided by .2352, or 44.13% of the total weight. Similarly the warp is found to constitute .1234 divided by .2352, or 52.47%, and the sizing to

constitute .0080 divided by .2352, or 3.40%, of the total weight. 44.13% + 52.47% + 3.40% = 100%.

To find percentage of sizing on warp, knowing percentages of filling, of unsized warp, and of sizing:

RULE 39: *Divide percentage of sizing in cloth by percentage of unsized warp in cloth.*

EXAMPLE: A cloth as woven is composed of 44.13% filling, 52.47% unsized warp, 3.40% sizing. What is the percentage of sizing on warp?

ANSWER: As the sizing constitutes 3.40% of the total weight of the cloth and the unsized warp yarn constitutes 52.47%, then there are 3.40 pounds of sizing to every 52.47 pounds of unsized warp yarn. Dividing 3.40 by 52.47 we get .0648, which shows 6.48% sizing on the warp.

To find approximate percentage of sized warp and of filling in a linear yard of cloth, knowing width, sley, pick, and yarn numbers:

RULE 40: *To total ends in warp add a percentage for sizing and divide by the warp yarn number to obtain relative weight of sized warp. Multiply picks per inch by width and divide by filling yarn number to obtain relative weight of filling. Divide each by their sum.*

EXAMPLE: A printcloth is woven 39 inches, 72x76, 30s.37s. What is the relation of warp (sized) and of filling?

ANSWER: Total ends in warp = 39x72 + 24 (extra selvage ends) = 2832. Assuming 6% sizing on warp, then 2832 × 1.06 = 3002. 3002 ÷ 30s = 100.06 = relative weight of warp. 39 (inches) × 76 (picks) ÷ 37s = 80.11 = relative weight of filling. 100.06 + 80.11 = 180.17.

Then 100.06 ÷ 180.17 = 55.54% warp (sized).

80.11 ÷ 180.17 = 44.46% filling.

NOTE—In this rule no allowance is made for the contraction (take-up) of the yarns in weaving. The results obtained are therefore approximate except in instances where the percentage of warp contraction is the same as the percentage of filling contraction.

To find approximate relation of warp yarn (unsized) and of filling yarn, knowing sley, pick, and yarn numbers:

RULE 41: *Divide sley by warp yarn number, and pick by filling yarn number, to obtain relative weights of warp and filling yarns Divide each by their sum.*

EXAMPLE: A cloth is made with 72 ends of 30s and 76 picks of 37s per square inch. What is the approximate relation of warp and filling yarns?

ANSWER:

72 ÷ 30 = 2.400 rel. wt. of warp yarn (unsized).
76 ÷ 37 = 2.054 rel. wt. of filling yarn.

4.454 rel. wt. of warp and filling yarns.

Then 2.400 ÷ 4.454 = 53.88% warp yarn (unsized).
2.054 ÷ 4.454 = 46.12% filling yarn.

NOTE—This rule, which is based on Rule 21, gives only approximate results because no allowance is made for yarn contractions nor for sizing on warp. If the percentage of sizing on warp be ascertained or assumed this rule can be modified as follows:

To find approximate relation of warp yarn (sized) and of filling yarn, knowing sley, pick, and yarn numbers:

RULE 41-A: *Divide sley plus sizing by warp yarn number, and pick by filling yarn number, to obtain relative weights of warp and filling. Divide each by their sum.*

EXAMPLE: (As above, but assuming 6% sizing on warp).

ANSWER: 72 × 1.06 = 76.32.

76.32 ÷ 30 = 2.544 rel. wt. of warp (sized).
76 ÷ 37 = 2.054 rel. wt. of filling.

4.598 rel. wt. of warp and filling.

Then 2.544 ÷ 4.598 = 55.33% warp (sized).
2.054 ÷ 4.598 = 44.67% filling.

To find approximate percentage of sized warp, knowing sley, pick, warp yarn number, and average yarn number:

RULE 42: *Multiply average yarn number by sley (plus sizing); divide product by warp yarn number and by sum of sley (plus sizing) and pick.*

EXAMPLE: A printcloth is made with 72 ends and 76 picks per square inch; the warp yarn number is 30s and the average yarn number is 33.25s. What is percentage of sized warp in the cloth?

ANSWER: Assuming 6% sizing on warp, then sley (sized) = 72 × 1.06 = 76.32 and sum of sley (sized) and pick = 76.32 + 76 = 152.32.

$$\frac{33.25 \times 76.32}{30 \times 152.32} = 55.53\% \text{ sized warp.}$$

NOTE—The percentage of filling, from above, would therefore be 100 — 55.53 = 44.47%. If, however, the problem had been to find the approximate percentage of filling, knowing sley, pick, average yarn number, and filling yarn number, the latter being given as 37s, then we would have proceeded as follows:

$$\frac{33.25 \times 76}{37 \times 152.32} = 44.84\% \text{ filling.}$$

Selection Of Yarn Numbers To Make A Certain Cloth

To find suitable yarn counts when width, weight and construction of cloth are given:

RULE 43: (a) *Ascertain average yarn number by Rule 17, assuming an approximate cloth constant from knowledge of similar goods.* (b) *Decide on a warp yarn number, not too far removed from the average yarn number, that fits best into the mill organization. Also decide on percentage of size preferred on warp.* (c) *Ascertain weight of sized warp in a convenient length of cloth, say 100 yards.* (d) *Find weight of filling, for same length of cloth, by subtracting weight of sized warp from weight of cloth.* (e) *The filling yarn number is then found by multiplying width in reed by picks per inch and by length of cloth, and dividing by 840 and by weight of filling.*

EXAMPLE: A mill receives an order for 36 inch, 56x60, 4-yard sheeting. The problem to be solved is as to the warp and filling yarns to be used.

ANSWER: (a) From experience with similar sheetings we may take 745 as approximately correct for the cloth constant. Then the average yarn number =

$$A = \frac{BYT}{C} = \frac{36 \times 4 \times 116}{745} = \frac{16{,}704}{745} = 22.4\text{s}.$$

(b) In most instances the warp yarn number is coarser than the filling yarn number and therefore coarser than the average yarn number. In this instance we may decide on 21s warp as best fitting into the existing organization and for the same reason decide on 6% sizing to be put on the warp.

(c) Before finding weight of sized warp it is necessary to find the length of warp from the slasher required to make a certain length of cloth. Turning to the table given for contraction on plain cloths and looking under the column headed 60 (in this case picks crossed by the warp) it is seen that average numbers of 22s and 23s show contractions of 8.5% and 8.2%. respectivelv, and by

interpolation the warp contraction corresponding to 22.4s average yarn count would be 8.38%. 1 — .0838 = .9162. 100 divided by .9162 gives 109.15 as yards from slasher required to produce 100 yards of cloth. The total ends in warp equal 36 inches times 56 sley, or 2016, plus 40 selvage ends, or 2056 ends total. Then weight of sized warp in 100 yards cloth = 2056 ends × 109.15 yards warp × 1.06 for sizing ÷ 21s warp yarn × 840 yds. per hank = 13.48 pounds.

(d) Weight of 100 yards of 4-yard cloth = 100 divided by 4 = 25 lbs. 25 — 13.48 = 11.52 lbs. filling.

(e) From the table given for contraction on plain cloths and under the column headed 56 (in this case warp ends crossed by the filling) we find by interpolation that 22.4s average yarn number would give 7.38% filling contraction. 1 — .0738 = .9262. .9262 × 56 sley, divided by 2 ends to the dent, gives a reed of 25.93 dents to the inch. This is so close to 26 that in most cases the latter would be used. Using a 26 dent reed the corrected filling contraction will be 56 minus 52, divided by 56, or 7.14%. 1 — .0714 = .9286. The cloth width, 36 inches, divided by .9286, gives width in reed as 38.77 inches. Then the filling yarn number required = 38.77 width in reed × 60 picks × 100 yds. cloth ÷ 840 yards per hank × 11.52 lbs. filling = 24s.

NOTE—The fact that 21s warp and 24s filling have been proved above to be suitable yarns to use in making this cloth does not mean that they constitute the only yarn combination that can be employed. In fact scarcely any two mills use exactly the same yarn numbers and reports from seven Southern mills that regularly employ all or part of their looms in making what is sold as 36-inch, 56x60, 4-yard gray sheeting show the following yarn combinations: (1) 20s.24s, (2) 20s.25s, (3) 20½s.23½s, (4) 21s.23s, (5) 21s.24s, (6) 22s.22s, (7) 22s.25s. Doubtless other mills employ still other yarns.

There are various reasons for the use of different yarns in making the same fabric. In many instances it is a case of convenience for it is to the interest of the mill to spin as few yarns as possible and if a mill is using 22s warp in making other cloths it may prove more economical to use 22s instead of 21s warp for this cloth also and in such case the filling would have to correspond to obtain the weight desired. The same is true as to the sizing and some mills size much heavier than others. Varying the percentage of sizing changes the center of gravity, that is, the average yarn number, and permits of a different yarn combination. On automatic looms the yards of filling that can be put on a quill is not so important but in the case of non-automatic looms the finer the filling

that can be used to obtain the desired result the better, as a longer length of filling on the quill means better production because of fewer changes of filling, and this fact is frequently a matter for consideration. On the other hand, having the warp slightly finer than the filling means that after sizing the two yarns will be more nearly uniform in diameter and this has its effect on the appearance of the cloth.

The fact also has to be considered that the cloth is not always made exactly to the nominal specifications. Even where this is attempted the fact that it is impossible to spin exactly to number, impossible to put exactly the same percentage of size on every cut, and impossible to use exactly the same tension on every loom so as to have the width invariable, is recognized in the trade to permit of a certain latitude. Advantage is taken of this leeway by some mills and the width, weight, or even the construction may regularly be run on the scant side of the nominal specifications. The extent to which this is allowable, however, depends largely on the nature of the trade to which the mill caters and some mills find it preferable to gain a reputation for their cloth by making it so that it will always average fully up to specifications or even slightly over in width.

It is seen that in the selection of counts to make this cloth there are various factors, outside of the simple calculations, to be considered and not only in this but in the case of other cloths, no matter how standard, there will be found differences from mill to mill. As an illustration take the case of the standard 38½ inch, 64x60, 5.35-yard printcloth which is most typical of the American industry today. A large number of mills use 30s warp and 40s filling but among other combinations stated by mills are to be found the following: (2) 28s.40s, (3) 28s.41s, (4) 28s.42s, (5) 28s.44s, (6) 28½s.38½s, (7) 28½s.39s, (8) 28½s.40½s, (9) 29s.38s, (10) 29s.42s, (11) 29½s.39s, (12) 30s.38s, (13) 30s.39s, (14) 30s.41s, (15) 30s.42s, (16) 33s.36s. As a further illustration consider the leader in the cheesecloth constructions, which is variously known as tobacco cloth, shade cloth, gauze cloth, cotton bandage cloth, and bunting, the 38½-inch, 44x40, 8.20-yard goods that are made in large quantities in many mills. For cloth made to nominally the same specifications we find mills employiny, among others, the following yarn combinations: (1) 28s.42s, (2) 28s.44s, (3) 29s.39s, (4) 29s.40s, (5) 29s.42½s, (6) 29½s.41s, (7) 30s.40s, (8) 30s.41s, (9) 30s.43s, (10) 30s.44s.

Assuming that the average mill attempts to make cloth as near as possible to the specifications stated on its order and invoice it would seem, from a study of the yarn variations used in making

the above and many other cloths, that, even allowing for the matter of convenience in fitting the manufacture of a particular cloth into the work of a mill making other cloths, many mills do not give the subject of yarn selection as much attention as it deserves. Certain it is that the correct selection of yarn counts is a matter that in itself often gives one mill an advantage over others, though this may be manifested in the obtainment of a better price for a better quality or in more economical cost of production.

Incidentally, it may be noted that the spread in the range between the warp and the filling counts usually increases with the fineness of the yarns. In ordinary staple sheetings the warp may be the same or a few numbers coarser than the filling, in ordinary printcloths the warp is usually 4 to 16 counts coarser than the filling, whereas in staple fine plains the warp may be 15 to 50 or more counts coarser than the filling. (For instance heavy sheetings are largely 12s to 14s warp and 13s to 17s filling, printcloths are largely 28s to 30s warp and 38s to 44s filling, whereas India linons are largely 60s warp and 80s to 110s filling.) In some classes of goods the filling is regularly coarser than the warp but this obtains more largely in goods that are more or less specialties such as blankets, flannelets, Canton flannel, repp, and tapestries.

Checking The Correctness Of Any Stated Yarn Combination

As previously noted, various yarn combinations may be used in making a cloth that is sold as of a certain width, weight, and construction. If the cloth is made exactly to the stated particulars the differences in the yarns employed are usually due to differences in the percentage of sizing added to the warp but may be due, in part at least, to differences in the number of extra ends used in the selvages. In many instances, however, the manufacturer does not make exactly to specifications and it is in such cases usually that he is most careful to keep secret the counts of the yarns employed. Knowing the yarn counts, in addition to the other cloth particulars, it is not difficult to determine, by calculation, if the cloth is being made to specifications or if the construction is being skimped or the warp weighted more heavily than customary.

To check the correctness of any stated yarn combination, knowing yarn numbers as well as the width, weight, and construction specified for the cloth:

RULE 44: (a) *Use Rule 21-a to obtain the approximate average yarn number.* (b) *Use Rule 14 to determine the warp contraction in weaving.* (c) *Use Rule 9-a to determine the filling contraction in weaving.* (d) *Multiply width in inches by ends per inch, and add extra ends for the selvages, to obtain total ends in warp.* (e) *Use Rules 35 and 36 to determine the weight of the unsized yarns, and add to the warp weight a percentage for sizing; the result is the weight of the cloth in pounds per linear yard. The reciprocal of the latter is the weight of the cloth in linear yards per pound.*

The result obtained will show if the goods run light or heavy with the yarn combination stated. The accuracy of the calculations can be checked by ascertaining the exact average yarn count, by Rule 18, and dividing this into BYT (the effective yarn length per pound of cloth) to obtain the cloth constant; this latter should fall within the range of cloth constants usual for the particular type of cloth under consideration.

As an illustration of how this rule works we will select a print-cloth of which the specifications listed are 38½ inches, 64x60, 5.35

yards per pound, and will check the correctness of three different yarn combinations, as follows: (1) 28½s.39s, a combination given in a published Yearbook; (2) 30s.40s, a combination reported by numerous mills; and (3) 30s.39s, a combination reported by a few mills. In each instance we will figure on 24 extra selvage ends and on 6% sizing on the warp.

EXAMPLE 1: A 38½-inch, 64x60, 5.35-yard printcloth is reported made with 28½s warp and 39s filling. To check the correctness of this yarn combination proceed as follows:

(a) Approximate average yarn count is obtained, by Rule 21-a, as follows:

$$A = \frac{124 \times 28.5 \times 39}{64 \times 39 + 60 \times 28.5} = 32.77, \text{ say } 32.8\text{s.}$$

(b) Warp contraction is obtained, by Rule 14, as follows: $60 \times 60 = 3600$. Yds. per lb. of "A" $= 32.8 \times 840 = 27{,}552$.

$$r^2 = p^2 + d^2 = \frac{1}{3{,}600} + \frac{1}{27{,}552} =$$

$$= \frac{31{,}152}{99{,}187{,}200} = \frac{1}{3183.9753}, \text{ and } r = \frac{1}{56.427}$$

Therefore warp contraction $= \dfrac{60 - 56.427}{60} = 5.95\%$, and U $= 1 - .0595 = .9405$.

(c) Filling contraction is obtained, by Rule 9-a, as follows:

$64 \times 64 = 4096$

$$r^2 = e^2 + d^2 = \frac{1}{4{,}096} + \frac{1}{27{,}552} =$$

$$\frac{31{,}648}{112{,}852{,}992} = \frac{1}{3565.8807}, \text{ and } r = \frac{1}{59.715}$$

Therefore filling contraction $= \dfrac{64 - 59.715}{64} = 6.70\%$, and

$V = 1 - .0670 = .9330$.

(d) Total ends in warp $= 38\frac{1}{2} \times 64 = 2464 + 24$ (extra selvage ends) $= 2488$.

(e) Weight of warp and filling, in pounds per linear yard, is obtained as follows:

Wt. warp =

$$\frac{2488}{.9405 \times 28.5 \times 840} = .11050 \times 1.06 = .11713 \text{ lb.}$$

Wt. filling =

$$\frac{38\tfrac{1}{2} \times 60}{.9330 \times 39 \times 840} = .07558 \qquad = .07558 \text{ lb.}$$

$$\frac{.07558}{.18608} \qquad \frac{}{.19271 \text{ lb.}}$$

Then $Y = 1 \div .19271 = 5.189$ yds. per lb.

Conclusion—A 5.35-yard cloth should weigh 1 divided by 5.35, or .18692 lb. per linear yard. In the above instance it is seen that the unsized warp and filling weigh .18608 lb. so that any sizing will make the cloth too heavy. With 6% sizing on the warp, the cloth weighs .19271 lb. per linear yard, equivalent to 5.189 yards per pound. No mill can afford to run cloth so much heavier than the weight specified. It appears fairly obvious from the above that any mill actually using 28½s warp and 39s filling in this 5.35-yard printcloth is not making the cloth up to specifications and is using fewer ends or picks, or both, than claimed.

Example 2: A 38½-inch, 64x60, 5.35-yard printcloth is reported made with 30s warp and 40s filling. To check the correctness of this yarn combination proceed as follows:

(a) Approximate average yarn count is obtained, by Rule 21-a, as follows:

$$A = \frac{124 \times 30 \times 40}{64 \times 40 + 60 \times 30} = 34.13, \text{ say } 34.1\text{s.}$$

(b) Warp contraction is obtained, by Rule 14, as follows:

$60 \times 60 = 3600$. Yds. per lb. of "A" $= 34.1 \times 840 = 28{,}644$.

$$r^2 = p^2 + d^2 = \frac{1}{3{,}600} + \frac{1}{28{,}644} =$$

$$\frac{32{,}244}{103{,}118{,}400} = \frac{1}{3198.0648}, \text{ and } r = \frac{1}{56.551}$$

$$\text{Therefore warp contraction} = \frac{60 - 56.551}{60} = 5.75\%, \text{ and}$$

$U = 1 - .0575 = .9425$.

(c) Filling contraction is obtained, by Rule 9-a, as follows:

$64 \times 64 = 4096$

$$r^2 = e^2 + d^2 = \frac{1}{4{,}096} + \frac{1}{28{,}644} =$$

$$\frac{32{,}740}{117{,}325{,}824} = \frac{1}{3583.5621}, \text{ and } r = \frac{1}{59.863}$$

$$\text{Therefore filling contraction} = \frac{64 - 59.863}{64} = 6.46\%, \text{and}$$

$V = 1 - .0646 = .9354.$

(d) Total ends in warp $= 38\frac{1}{2} \times 64 = 2464 + 24$ (extra selvage ends) $= 2488$.

(e) Weight of warp and filling, in pounds per linear yard, is obtained as follows:

Wt. warp =

$$\frac{2488}{.9425 \times 30 \times 840} = .10475 \times 1.06 = .11104 \text{ lb.}$$

Wt. filling =

$$\frac{38\frac{1}{2} \times 60}{.9354 \times 40 \times 840} = \frac{.07350}{.17825} = \frac{.07350 \text{ lb.}}{.18454 \text{ lb.}}$$

Then $Y = 1 \div .18454 = 5.419$ yds. per lb.

Conclusion—The above shows that a 5.35-yard printcloth made with 30s warp and 40s filling would weigh, with 6% sizing on warp, about 5.419 yards per pound. This is rather light and to come up to specifications the sizing on warp would have to be increased to about $8\frac{1}{4}\%$.

Example 3: A $38\frac{1}{2}$-inch, 64x60, 5.35-yard printcloth is reported made with 30s warp and 39s filling. To check the correctness of this yarn combination proceed as follows:

(a) Approximate average yarn count is obtained, by Rule 21-a, as follows:

$$A = \frac{124 \times 30 \times 39}{64 \times 39 + 60 \times 30} = 33.77, \text{ say } 33.8\text{s.}$$

(b) Warp contraction is obtained, by Rule 14, as follows:

$60 \times 60 = 3600$. Yds. per lb. of "A" $= 33.8 \times 840 = 28.392$.

$$r^2 = p^2 + d^2 = \frac{1}{3{,}600} + \frac{1}{28{,}392} =$$

$$\frac{31{,}992}{102{,}211{,}200} = \frac{1}{3194.8990}, \text{ and } r = \frac{1}{56.523}$$

Therefore warp contraction $= \dfrac{60 - 56.523}{60} = 5.80\%$, and

$U = 1 - .0580 = .9420$.

(c) Filling contraction is obtained, by Rule 9-a, as follows: $64 \times 64 = 4{,}096$

$$r^2 = e^2 + d^2 = \frac{1}{4{,}096} + \frac{1}{28{,}392} =$$

$$\frac{32{,}488}{116{,}293{,}632} = \frac{1}{3579.5873}, \text{ and } r = \frac{1}{59.830}$$

Therefore filling contraction $= \dfrac{64 - 59.830}{64} = 6.52\%$, and

$V = 1 - .0652 = .9348$.

(d) Total ends in warp $= 38\frac{1}{2} \times 64 = 2464 + 24$ (extra selvage ends) $= 2488$.

(e) Weight of warp and filling, in pounds per linear yard, is obtained as follows:

Wt. warp $=$

$$\frac{2488}{.9420 \times 30 \times 840} = .10481 \times 1.06 = .11110 \text{ lb.}$$

Wt. filling $=$

$$\frac{38\frac{1}{2} \times 60}{.9348 \times 39 \times 840} = \frac{.07543}{.18024} = \frac{.07543}{.18653} \text{ lb.}$$

Then $Y = 1 \div .18653 = 5.361$ yds. per lb.

Conclusion—The above shows that a 5.35-yard printcloth made with 30s warp and 39s filling would weigh, with 6% sizing on warp, about 5.36 yards per pound. The yarn combination used is therefore correct for making the cloth exactly to specifications.

Weight Of Cloth
From Weight Of A Small Sample

Knowing the area and weight of a small sample, there can be obtained, by simple calculation, the weight of the cloth in square yards per pound and in ounces per square yard, or, if the width of the cloth is also known, the weight of the cloth in linear yards per pound and in ounces per linear yard. Rules for such calculations, when the area of the sample is stated in square inches and the weight of the sample in grains, are given below.

To find, from a small sample, the weight of the cloth in yards per pound:

RULE 45.—*Multiply square inches in sample by 194.4 and divide by weight of sample in grains and by width of cloth in inches.*

NOTE—The constant 194.4 is obtained by dividing 7000 (grains in a pound) by 36 (inches in a yard).

To find, from a small sample, the weight of the cloth in square yards per pound:

RULE 45-A: *Multiply square inches in sample by 5.4 and divide by weight of sample in grains.*

NOTE—The constant 5.4 is obtained by dividing 7000 (grains in a pound) by 1296 (square inches in a square yard).

To find, from a small sample, the weight of the cloth in ounces per linear yard:

RULE 45-B: *Multiply weight of sample in grains by 36 and by width of cloth in inches; divide product by square inches in sample and by 437.5 (grains per ounce).*

To find, from a small sample, the weight of the cloth in ounces per square yard:

RULE 45-C: *Multiply weight of sample in grains by 1296 (square inches in a square yard); divide product by square inches in sample and by 437.5 (grains per ounce).*

To find, from a small sample, the weight of the cloth in kilos per 100 square meters:

RULE 45-D: *Multiply weight of sample in grains by 1953; divide product by square inches in sample and by 194.4.*

NOTE—The constant 1953 is obtained by multiplying 119.6 (square yards per 100 square meters) by 36 (inches) and dividing by 2.2046 (pounds per kilogram).

EXAMPLE: A small sample cut 4 by 4 inches, and therefore containing 16 square inches, weighs 51.852 grains. Width of cloth is 30 inches. What is the weight of the cloth in the different units?

ANSWERS:

By Rule 45:

$$Y = \frac{16 \times 194.4}{51.852 \times 30} = 2 \text{ linear yds. per lb.}$$

By Rule 45-a:

$$S = \frac{16 \times 5.4}{51.852} = 1.66 \text{ sq. yds. per lb.}$$

By Rule 45-b:

$$Z = \frac{51.852 \times 36 \times 30}{16 \times 437.5} = 8 \text{ oz. per linear yd.}$$

By Rule 45-c:

$$Z' = \frac{51.852 \times 1296}{16 \times 437.5} = 9.60 \text{ oz. per sq. yd.}$$

By Rule 45-d:

$$K' = \frac{51.852 \times 1953}{16 \times 194.4} = 32.55 \text{ kilos per 100 sq. meters.}$$

Rule 45-d is inserted for use by those interested in export trade. The weight basis of kilos (kilograms) per 100 square meters is used in the cloth tariffs of various foreign countries.

Instead of the English system of grains and square inches, some prefer to use the metric system of grams and square centimeters. One ounce equals 437.5 grains or 28.35 grams, and one square yard equals 1296 square inches or 8361 square centimeters, therefore

$$Z' = \frac{\text{ounces}}{\text{sq. yds.}} = \frac{1296 \times \text{grains}}{437.5 \times \text{sq. in.}} = \frac{2.9624 \times \text{grains}}{\text{square inches}}$$

$$= \frac{8361 \times \text{grains}}{437.5 \times \text{sq. cm.}} = \frac{1296 \times \text{grams}}{28.35 \times \text{sq. in.}} = \frac{8361 \times \text{grams}}{28.35 \times \text{sq. cm.}}$$

$$= \frac{19.112 \times \text{grains}}{\text{sq. cm.}} = \frac{32 \times \text{grams}}{.7 \times \text{sq. in.}} = \frac{294.93 \times \text{grams}}{\text{sq. cm.}}$$

The above can be stated, for use when sample data is stated in whole or in part in metric units, as follows:

To find, from a small sample, the weight of the cloth in ounces per square yard:

RULE 46.—*Multiply weight of sample in grains by 19.112 and divide by square centimeters.*

RULE 46-A: *Multiply weight of sample in grams by 32 and divide by square inches and by .7.*

RULE 46-B: *Multiply weight of sample in grams by 294.93 and divide by square centimeters.*

NOTE—Having the weight in ounces per square yard, the weight in other units can be easily obtained since

$$S = \frac{16}{Z'}; \; Z = \frac{BZ'}{36}; \text{ and } Y = \frac{576}{BZ'}$$

Cloth Analysis

If the width of the cloth and the type of selvage are known or specified, all details necessary for the duplication of a fabric can usually be obtained from the analysis of a small sample. The sample may be of any size but, even when ample material is available, an area of 16 square inches is usually sufficient for accurate results. In preparing the sample, the best practice is to use shears to cut out an area somewhat larger than needed and, after identifying warpways by means of a pencil line, to gradually remove ends and picks until the body of the sample is of the exact size desired; the projecting threads are then cut off even with the lines of the warp and filling so that each thread remaining in the sample is intact throughout its length. Because of the difficulty of stamping out a sample with each thread continuous in length, it is not advisable to use a die except in cases where the weight is the only factor required.

To determine the number of the yarn, warp or filling, it is necessary to ascertain the spun length and the weight. Using either English or metric units, the English yarn number can be obtained as follows:

The cotton yarn number = hanks per pound =

$$\frac{\text{yards}}{\text{lbs.} \times 840} = \frac{\text{yards} \times 7000}{\text{grains} \times 840} = \frac{\text{yards}}{\text{grains} \times .12} =$$

$$\frac{\text{inches} \times 7000}{\text{grains} \times 36 \times 840} = \frac{\text{inches}}{\text{grains} \times 4.32} =$$

$$\frac{\text{centimeters} \times .3937}{\text{grams} \times 15.432 \times 4.32} = \frac{\text{centimeters} \times 3}{\text{grams} \times 508} =$$

$$\frac{\text{centimeters} \times .0059}{\text{grams}} = \frac{\text{meters} \times .059}{\text{kilograms}}$$

Comparing yarns with others of known size, to determine the count, is a very crude method that has no value except for rough approximations. The correct yarn count can be found only by measuring and weighing.

With the exception of coarse ply yarns, such as those used in duck, the yarns in the warp are sized and the yarn count obtained by measuring and weighing is the count of the warp in the sized condition. To obtain the spun count it is necessary to remove the size and reweigh. The yarn can be stripped of the size by boiling in a weak solution of soda or steeping in a weak solution of acid; it is then rinsed in clean water and dried. In drying, the yarn is put in a glass jar or bottle which is placed in an oven. It is preferable to use a small drying oven to which is attached a thermometer and to bring the temperature up to 212 degrees. On removing the bottle, sufficient time should be allowed for cooling, and the yarn then extracted with pincers (to avoid moisture from the hands) and weighed. This gives the bone dry weight, to which should be added 7.834% to bring the yarn up to its natural condition with 8½% moisture content.

To analyze a sample of cloth to determine all details necessary for duplication:

RULE 47: (1) *Use pick glass to determine weave, whether yarns are single or ply, and the number of ends and picks per square inch. If sample includes a selvage, count the number of extra ends used therein.*

(2) *Cut sample to exact size desired, with each warp and filling thread included intact, and weigh on an accurate balance. Knowing the exact area and weight of the sample, the weight of the cloth is found by means of Rules 45 or 46.*

(3) *Ravel sample and make separate piles of the warp and filling threads. Count ends and weigh; count picks and weigh. Figure relative weights of sized warp and of filling as percentages of the total weight.*

(4) *To determine the original length of warp, also of filling, taken from the sample use the average of ten measurements, in each instance stretching the yarn just enough to remove the crimp caused by weaving. The original length minus the length in sample, divided by the original length, gives the percentage of contraction in weaving. Ply yarns should then be untwisted and the singles measured to obtain the spun length. The spun length minus the length in sample, divided by the spun length, gives the percentage of contraction from single yarn to cloth.*

(5) *The counts of the single yarns, warp and filling, respectively, are obtained by multiplying the number of single threads in the sample by the spun length in inches, and dividing by the weight of these threads in grains and by the constant 4.32. If the warp contains sizing, the count thus obtained is the sized count of the warp yarn.*

(6) *Determine spun count of the warp yarn by removing the sizing and re-weighing.*

(7) *Total ends in warp are obtained by multiplying the width of the cloth in inches by the ends per inch and adding extra ends for the selvages.*

(8) *Length of warp required for a definite length of cloth is obtained by dividing length of cloth by U (= 1 minus percentage warp contraction in weaving).*

(9) *Dents per inch of reed required are obtained by multiplying the ends per inch by V (= 1 minus percentage filling contraction in weaving), and dividing by ends per dent.*

To illustrate the operation of the above system there are given below three analyses made from samples of cloth, the first being a sheeting, the second a broadcloth, and the third a duck. In making these analyses the author has used, by preference, the metric system and then converted to the English system by multiplying grams by 15.432 to obtain grains, and multiplying centimeters by .3937 to obtain inches, but there is no reason why either the English system, or the metric system, cannot be used alone throughout.

Analysis of Cotton Sheeting

Trade description. Cotton Sheeting, 36″, 48x48, 3 yds. per lb. in the gray.

(1) Pick glass examination showed: Plain weave, single yarns, 47¼x47½, with 20 ends extra in one selvage and 19 in the other.

(2) Sample cut 4 by 4 inches, containing 16 square inches, weighed 1.855 grams.

$$1.855 \times 15.432 \text{ (grains to a gram)} = 28.626 \text{ grains.}$$

$$Y = \frac{16 \text{ sq. in.} \times 194.4}{28.626 \text{ grains} \times 36 \text{ inches}} = 3.018 \text{ yds. per lb.}$$

(3) Sample was ravelled and ends and picks counted and weighed.

187 ends weighed	.960 grams or	14.814 grains.	(51.75%)
191 picks weighed	.895 grams or	13.812 grains.	(48.25%)
Total	1.855 grams or	28.626 grains.	(100%)

(4) The yarns from the sample were stretched just enough to remove the crimp and measured. The warp averaged 11.30 centi-

meters, equal to 11.30 × .3947 (inches to a centimeter), or 4.449 inches; the filling averaged 11.05 centimeters or 4.350 inches. In the woven sample both warp and filling covered a distance of 4 inches (10.16 centimeters), therefore

$$\text{Warp contraction} = \frac{4.449 - 4}{4.449} = 10.09\%, \text{ and } U = 1 - .1009 = .8991$$

$$\text{Filling contraction} = \frac{4.350 - 4}{4.350} = 8.05\%, \text{ and } V = 1 - .0805 = .9195$$

(5) Yarn numbers were then found as follows:

$$\text{Warp yarn} = \frac{187 \text{ ends} \times 4.449 \text{ inches}}{14.814 \text{ grains} \times 4.32} = 13.00\text{s (sized)}$$

$$\text{Filling yarn} = \frac{191 \text{ picks} \times 4.350 \text{ inches}}{13.812 \text{ grains} \times 4.32} = 13.92\text{s}$$

(6) The warp yarn was stripped of the sizing and the spun count found to be 14s. Percentage of sizing on warp = 14s — 13s, divided by 14s, or 7.14%.

(7) Total ends in warp = 36 × 47¼ = 1701 plus 39 (extra selvage ends) = 1740.

(8) Length of warp required per 100 yards of cloth =

$$L' = \frac{L}{U} = \frac{100}{.8991} = 111.22 \text{ yards.}$$

(9) $$\text{Reed required} = \frac{E \times V}{\text{ends per dent}} = \frac{47.25 \times .9195}{2}$$

= 21.719 dents per inch. If 40½ inch reed be used it has 21.719 × 40.5, or 880 dents spread on 40½ inches.

Analysis of a Cotton Broadcloth Shirting

Trade description: Cotton Broadcloth, 37″, 128x68, 4.40 yds. per lb. in the gray.

(1) Pick glass examination showed: Plain weave, single yarns, 122x68, with 12 ends extra in each selvage.

(2) Sample cut 4 by 4 inches, containing 16 square inches, weighed 1.230 grams or 18.981 grains.

$$Y = \frac{16 \text{ sq. in.} \times 194.4}{18.981 \text{ grains} \times 37 \text{ inches}} = 4.429 \text{ yds. per lb.}$$

(3) Sample was ravelled and ends and picks counted and weighed.

489 ends weighed	.870 gram or	13.426 grains.	(70.73%)
270 picks weighed	.360 gram or	5.555 grains.	(29.97%)
Total	1.230 grams or	18.981 grains.	(100%)

(4) The yarns from the sample were stretched just enough to remove the crimp and measured. The warp averaged 11.50 centimeters or 4.528 inches; the filling averaged 10.60 centimeters or 4.173 inches. In the woven sample both warp and filling covered a distance of 4 inches, therefore

$$\text{Warp contraction} = \frac{4.528 - 4}{4.528} = 11.66\%, \text{ and } U = 1 - .1166 = .8834.$$

$$\text{Filling contraction} = \frac{4.173 - 4}{4.173} = 4.15\%, \text{ and } V = 1 - .0415 = .9585.$$

(5) Yarn numbers were then found as follows:

$$\text{Warp yarn} = \frac{489 \text{ ends} \times 4.528 \text{ inches}}{13.426 \text{ grains} \times 4.32} = 38.18\text{s (sized)}$$

$$\text{Filling yarn} = \frac{270 \text{ picks} \times 4.173 \text{ inches}}{5.555 \text{ grains} \times 4.32} = 46.95\text{s}$$

(6) The warp yarn was stripped of the sizing and the spun count found to be 40s. Percentage of sizing on warp = 40s — 38.18s, divided by 40s = 4.55%.

(7) Total ends in warp = 37 × 122 = 4514 plus 24 (extra selvage ends) = 4538.

(8) Length of warp required per 100 yards of cloth =

$$L' = \frac{L}{U} = \frac{100}{.8834} = 113.20 \text{ yards.}$$

(9) Reed required = R =

$$\frac{E \times V}{\text{ends per dent}} = \frac{122 \times .9585}{4} = \frac{116.937}{4} = 29.234$$

dents per inch, or 29.234 × 40.5 = 1184 dents spread on 40½-inch reed. (If 3 ends be used per dent, the reed required = 116.937 divided by 3 = 38.979 dents per inch, or 38.979 × 40.5 = 1578 dents spread on 40½-inch reed.)

Analysis of a Heavy Cotton Duck

Trade description: Oil Press Cloth, No. 12/0, 36-inch (P/R 30 oz., 22″), in the gray.

(1) Pick glass examination showed: Regular plain weave, with 20 ends of 13-ply warp and 13 picks of 13-ply filling per square inch. No extra ends in selvage.

(2) Sample cut 4 by 4 inches, containing 16 square inches, weighed 17.280 grams or 266.665 grains.

$$Z' = \frac{266.665 \text{ grains} \times 1296}{16 \text{ sq. in.} \times 437.5} = 49.371 \text{ oz. per sq. yd.}$$

(3) Sample was ravelled and ends and picks counted and weighed.

80 ends 13-ply (1040 single threads) weighed	11.580 grams or	178.703 grains.	(67.01%)
52 picks 13-ply (676 single threads) weighed	5.700 grams or	87.962 grains.	(32.99%)
Total	17.280 grams or	266.665 grains.	(100%)

(4) The ply yarns from the sample were stretched just enough to remove the crimp and measured, then they were untwisted and the singles stretched and measured. The ply warp measured 13.00 centimeters (5.118 inches) and the singles 13.90 centimeters (5.472 inches); the ply filling measured 10.40 centimeters (4.094 inches) and the singles 10.70 centimeters (4.212 inches). In the woven sample both warp and filling covered a distance of 4 inches, therefore

Contraction of ply yarn in weaving—

$$\text{Warp: } \frac{5.118 - 4}{5.118} = 21.84\%, \text{ and } U = 1 - .2184 = .7816.$$

$$\text{Filling: } \frac{4.094 - 4}{4.094} = 2.30\%, \text{ and } V = 1 - .0230 = .9770.$$

Contraction of single yarn in twisting—

$$\text{Warp: } \frac{5.472 - 5.118}{5.472} = 6.47\%$$

$$\text{Filling: } \frac{4.212 - 4.094}{4.212} = 2.80\%$$

Contraction from single yarn to cloth—

$$\text{Warp: } \frac{5.472 - 4}{5.472} = 26.90\%. \quad 1 - .2690 = .7310$$

$$\text{Filling: } \frac{4.212 - 4}{4.212} = 5.03\%. \quad 1 - .0503 = .9497$$

(5) The counts of the single yarns were then found as follows:

$$\text{Warp yarn} = \frac{1040 \text{ threads} \times 5.472 \text{ inches}}{178.703 \text{ grains} \times 4.32} = 7.37\text{s}$$

$$\text{Filling yarn} = \frac{676 \text{ threads} \times 4.212 \text{ inches}}{87.962 \text{ grains} \times 4.32} = 7.32\text{s}$$

(6) No sizing is used on such coarse ply yarns so the 7.37s found above represents the spun count of the warp yarn.

(7) Total ends in warp, no selvage being required, are 36 × 20 = 720 ply ends containing 720 × 13 (ply) = 9360 single warp threads.

(8) Length of ply warp required per 100 yards of

$$\text{cloth} = \frac{L}{U} = \frac{100}{.7816} = 127.94 \text{ yards.}$$

Length of single warp required per 100 yards of

$$\text{cloth} = \frac{100}{.7310} = 136.80 \text{ yards.}$$

(9) $$\text{Reed required} = \frac{E \times V}{\text{ends per dent}} = \frac{20 \times .9770}{1} = 19.54$$

dents per inch. If 40½-inch reed be used it has 19.54 × 40.5, or 791 dents spread on 40½ inches.

Note—In whatever width ordered, the weight of No. 12/0 duck is based on the 22-inch width weighing 30 ounces, this being indi-

cated as P/R or pro rata (meaning in proportion to) 30 oz., 22 inches. The weight per square yard should therefore be 30 $\times$ 36, divided by 22, equal to 49.09 ounces. The particular sample analyzed showed 49.37 ounces per square yard, indicating that the cloth was running heavier than specified.

Production Problems

In almost any weave shed, but particularly in those making a variety of goods, production problems are constantly coming up for solution, and in order to make the best use of the available looms these problems have to be solved intelligently and in many cases quickly. The main problem of course is as to the output that can be expected of a loom on a certain cloth, knowledge of this being essential in fixing the rate per cut as well as in knowing how many looms to allocate to a certain order so as to finish it on time. Closely allied to production problems are those relating to the amount of warp and filling that will be required from week to week to keep the looms in operation.

Cloth Production

The yards of cloth produced per loom depend on the picks per inch, the picks per minute, and the time the loom is in actual operation. Theoretical or 100% production is of course never attained in practice for there is more or less loss of time in piecing up broken ends and, in the case of non-automatic looms, in changing shuttles; the loom also stands while the loom fixer is making adjustments or repairs, and while warps are being renewed. The amount of time lost depends on many factors, such as the nature of the goods, the quality of the material, the speed of the looms, the skill of the weaver, the efficiency of the loom fixer, and the character of the management, so that there is a wide variation from mill to mill or even between two weavers in the same alley.

The following percentages of full-time production may be taken as indicative of good practice:

90 to 95% production on plain looms, automatic.
85 to 90% production on plain looms, non-automatic.
85 to 90% production on dobby looms, automatic.
80 to 85% production on dobby looms, non-automatic.
80 to 90% production on ordinary drop-box looms.
75 to 85% production on drop-box dobbies.
75 to 85% production on Jacquards.

There are some mills that attain a better production than the normal maximums stated but there are a large number that for various reasons fall under the normal minimums stated.

The percentage of full-time production, that is, the ratio of the yards actually produced to the yards that could be produced if there were no stoppage of the loom for any cause, is commonly for brevity known as the loom "efficiency."

NOTE—Some mill records show for certain looms operated by certain weavers on certain cloths an efficiency of 96%, 97%, or even 98%, but in most cases this is due to the weaver leaving his automatic looms running unattended during the lunch period. There are few looms that under the best conditions and with the best material average less than 5% stoppage so the high efficiencies just stated are due to actual hours of operation being more than the nominal 40 hours on which the theoretical 100% weekly production is calculated.

To find 100% production (no allowance for stops), in 60 hours:

RULE 48: *Multiply picks per minute by 100 and divide by picks per inch.*

EXAMPLE: A loom on 36-inch, 48x48, 3-yard sheeting is run at 180 picks per minute. What is theoretical or 100% production in 60 hours?

$$\text{ANSWER: } \frac{180 \times 100}{48} = 375 \text{ yards.}$$

NOTE—This is a very convenient rule to remember as a basis, even though mills no longer work 60 hours. Knowing 100% production in 60 hours, 100% production in any other period of time can be obtained by proportion. Thus 100% production in 48 hours $= .8 \times 375 = 300$ yards, and 100% production in 40 hours $= 2/3 \times 375 = 250$ yards, since 48 hours is eight-tenths and 40 hours is two-thirds of 60 hours.

To find 100% production (no allowance for stops), in any number of hours:

RULE 49: *Multiply picks per minute by total minutes weave shed is run; divide product by picks per inch and by 36.*

EXAMPLE: A loom on 48 pick goods is run at 180 picks per minute. What is 100% production in a full-time week of 40 hours?

$$\text{ANSWER: } \frac{180 \times 60 \times 40}{48 \times 36} = 250 \text{ yards.}$$

To find yards woven per loom per week:

RULE 50: *Multiply picks per minute by 60 (minutes in hour), by full-time hours, and by per cent of theoretical production attained; divide product by picks per inch and by 36 (inches in yard).*

EXAMPLE: A loom on 38½-inch, 44x40, 8.20-yard cheesecloth is run at 174 picks per minute. What is 90% production in a full-time week of 40 hours?

$$\text{ANSWER: } \frac{174 \times 60 \times 40 \times .90}{40 \times 36} = 261 \text{ yards.}$$

To find cuts of cloth woven per loom per week:

RULE 51: *Multiply picks per minute by 60, by full-time hours, and by per cent of theoretical production attained; divide product by picks per inch, by 36, and by yards per cut.*

EXAMPLE: A loom on 40-pick goods is run at 174 picks per minute. How many cuts of 60 yards each are obtained in a week of 40 hours, assuming 90% loom efficiency?

$$\text{ANSWER: } \frac{174 \times 60 \times 40 \times .90}{40 \times 36 \times 60} = 4.35 \text{ cuts.}$$

NOTE—Since 60 and 36 are constants it is possible to slightly shorten the two preceding rules by substituting division by .6 in place of multiplying by 60 and dividing by 36.

To find yards woven per loom per week, using constants:

RULE 52: *Multiply picks per minute by the appropriate constant from the following list and divide by picks per inch.*

Per cent of production.	Constant to use for 40 hours.	Constant to use for 48 hours.	Constant to use for 60 hours.	Constant to use for 80 hours.
50	33.33	40	50	66.66
55	36.66	44	55	73.33
60	40	48	60	80
65	43.33	52	65	86.66
70	46.66	56	70	93.33
75	50	60	75	100
80	53.33	64	80	106.66
85	56.66	68	85	113.33
87½	58.33	70	87½	116.66
90	60	72	90	120
92½	61.66	74	92½	123.33
95	63.33	76	95	126.66
100	66.66	80	100	133.33

EXAMPLE: A loom on 40-pick goods is run at 174 picks per minute. Assuming production to be 90% of the theoretical, how many yards are woven per week of 40 hours?

ANSWER: $\frac{174 \times 60}{40} = 261$ yards.

To find yards woven per loom per week, using production table:

RULE 53: *Multiply the 100% production shown per loom per hour by hours run and by percentage of theoretical production attained.*

EXAMPLE: A loom on 80-pick goods is run at 165 picks per minute. Assuming production to be 91% of the theoretical, how many yards are woven per week of 40 hours?

ANSWER: According to Table 2, theoretical 100% production per loom per hour would be 3.44 yards, therefore actual production in 40 hours would be $3.44 \times 40 \times .91 = 125.2$ yards.

To find loom efficiency when loom speed, picks per inch, and yards woven in a stated time, are known:

RULE 54: *Multiply picks per inch by .6 and by yards woven; divide by picks per minute and by hours run.*

NOTE—The .6 is obtained by dividing 36 (inches per yard) by 60 (minutes in hour).

EXAMPLE: A loom running 110 picks per minute on 90-inch, 64x66, 1.39-yard wide sheeting gets off 105 yards in a week of 40 hours. What is the loom efficiency?

ANSWER: $\frac{66 \times .6 \times 105}{110 \times 40} = 94.5\%$ production.

To find pounds of cloth produced per loom per week:

RULE 55: *Multiply picks per minute by minutes operated (allowing for stops); divide product by picks per inch, by 36, and by yards per pound.*

EXAMPLE: A loom on 38½-inch, 64x64, 5.15-yard printcloth is changed to 36-inch, 20x16, 21-yard gauze cloth for surgical dressings. Assuming speed of 170 picks per minute and production of 85% to be the same in both cases, what are the relative pounds of cloth produced in 40 hours?

ANSWER: $\frac{170 \times 60 \times 40 \times .85}{64 \times 36 \times 5.15} = 29.23$ lbs. of 5.15-yard printcloth.

$$\frac{170 \times 60 \times 40 \times .85}{16 \times 36 \times 21} = 28.67 \text{ lbs. of 21-yard gauze cloth.}$$

NOTE—The above illustration is reminiscent of World War I. Many mills that were called on by the Government to change from printcloths to plain-woven "gauze cloths" (commonly known as tobacco cloth constructions) found that there was practically no change in the yarn numbers or in the amounts of yarn required from the spinning room, nor in the pounds of cloth that could be produced if warps were available, but that it was impossible to change over the whole mill to the faster-running gauze cloths because of lack of slasher capacity. While the pounds of warp required might be the same, the fewer ends in the gauze cloth warps meant that two or three times as many yards of warp had to be put through the slashers and it was impossible to speed them up in anything like this proportion.

Incidentally, in World War II, when the entire cotton mill industry was involved, the most serious shortage was in cards, followed by twisters and wide looms. A great many mills were ordered to make goods coarser than those for which they were designed. Inasmuch as the coarser the goods the more cards but the fewer spindles required for a given number of looms, this upsetting of the mill balance resulted in an acute shortage of cards while the spindles were more than ample. Weavers were ordered to make subcount cloths by the omission of 2 to 4 picks but this was due not so much to any shortage of looms as to get the maximum yards of cloth from the yarn that could be spun from the available output of the card room. There was a shortage in wide looms, in part alleviated by the utilization of carpet looms to make blankets, wide sheetings and duck.

To find number of picks per pound of cloth:

RULE 56: *Multiply picks per inch by 36 (inches in yard) and by linear yards of cloth per pound.*

EXAMPLE: An 80x80 printcloth weighs 4 yards per pound, and an 8x8 tobacco cloth weighs 40 yards per pound. How many picks required to weave a pound of each cloth?

ANSWER: $80 \times 36 \times 4 = 11{,}520$, and $8 \times 36 \times 40 = 11{,}520$. Therefore the same number of picks, 11,520, is required to weave a pound of either cloth.

NOTE—Picks per pound of cotton cloth vary from less than 1,000 to more than 75,000. For instance, only 250 picks are required to weave a pound of No. 12/0 duck made 22 inches, 30

ounces per yard, 20x13, of 7/13 ply warp and filling, whereas 65,-772 picks are required to weave a pound of fine lawn made 32 inches, 15.75 yds. per lb., 108x116, of 120s warp and 180s filling. Similar cloths, say printcloths, made of approximately the same yarns and having approximately the same number of picks per pound will cost about the same per pound, even though differences in construction may result in widely differing quotations per yard. A small number of picks per pound indicates coarse yarns, and a low ratio of conversion cost (labor and overhead) to material cost, whereas a large number of picks per pound indicates fine yarns, and a high ratio of conversion cost to material cost.

To find number of picks per week woven by a weaver:

RULE 57: *Multiply picks per minute by 60 (minutes in hour), by 40 (hours per week), by loom efficiency (expressed as a percentage of the theoretical full-time production), and by the number of looms operated by the weaver.*

EXAMPLE 1: A weaver on handkerchief lawn (combed) made 40 inches, 8.50 yds. per lb., 88x80, of 60s warp and 100s filling, operates 36 looms at 155 picks per minute and 85% efficiency. How many picks does he weave per week of 40 hours?

ANSWER: 155 × 60 × 40 × .85 = 316,200 picks per loom, times 36 looms = 11,383,200 picks total.

EXAMPLE 2: A weaver on denim made 30 inches, 2.41 yds. per lb., 63x44, of 9s blue warp and 16s white filling, operates 32 looms at 185 picks per minute and 88% efficiency. How many picks does he weave per week of 40 hours?

ANSWER: 185 × 60 × 40 × .88 = 390,720 picks per loom, times 32 looms = 12,503,040 picks total.

EXAMPLE 3: A weaver on wide bed sheeting made 81 inches, 1.31 yds. per lb., 68x74, of 21s warp and 22s filling, operates 36 looms at 108 picks per minute and 92% efficiency. How many picks does he weave per week of 40 hours?

ANSWER: 108 × 60 × 40 × .92 = 238,464 picks per loom, times 36 looms = 8,584,704 picks total.

EXAMPLE 4: A weaver on sheeting made 36 inches, 2.85 yds. per lb., 48x48, of about 13s warp and filling, operates 112 looms at 168 picks and 93% efficiency. How many picks does he weave per week of 40 hours?

ANSWER: 168 × 60 × 40 × .93 = 374,976 picks per loom, times 112 looms = 41,997,312 picks total.

NOTE—The data in the foregoing examples were taken from

actual mill records of 1941-44. The 112 looms per weaver on narrow sheeting, although the highest shown for this cloth in any of the records inspected, was the regular loom assignment for weavers in one Southern mill.

Not used in the examples, because more abnormal, is the fact that in another Southern mill one weaver operated 153 looms on cheesecloth made 36 inches, 23 yds. per lb., 20x12, of 30s warp and 41s filling. With loom speed of 172 picks per minute and efficiency of 89% this weaver produced 130,118 yards of cloth containing 56,210,976 picks, per week of 40 hours. At this rate his production per year of 50 working weeks would be 6,505,900 yards (36 inches wide) of cloth, an amount sufficient to cover 1,344 acres or 2.1 square miles.

To estimate time required to weave a certain length of cloth:

RULE 58: *Multiply picks per inch by 36 (inches per yard) and by yards of cloth desired; divide product by picks per minute, by 60 (minutes per hour), and by estimated loom efficiency.*

EXAMPLE: Loom is running 160 picks per minute on 39-inch, 68x72, 4.75-yard printcloth. Figuring on 95% efficiency, how long would it take to exhaust a loom beam that holds warp enough for 1,200 yards (20 cuts of 60 yards each) of cloth?

$$\text{ANSWER: } \frac{72 \times 36 \times 1{,}200}{160 \times 60 \times .95} = \frac{3{,}110{,}400 \text{ picks total}}{9{,}120 \text{ picks per hour}} = 341 \text{ hours.}$$

To estimate looms required to fill an order in a certain time:

RULE 59: *Multiply yards cloth required by 36 (inches per yard) and by picks per inch; divide product by picks per minute, by 60 (minutes in hour), by loom efficiency, and by hours allowed for filling order.*

EXAMPLE: A mill accepts an order for 100,000 yards of 39-inch, 68x72, 4.75-yard printcloth to be shipped in 6 weeks. Mill works 80 hours (2 shifts) a week (so 6 weeks = 480 hours) and on these goods runs looms at 160 picks per minute, obtaining about 95% production. How many looms should be allotted to this order?

$$\text{ANSWER: } \frac{100{,}000 \times 36 \times 72}{160 \times 60 \times .95 \times 480}$$

$$= \frac{259{,}200{,}000 \text{ picks in } 100{,}000 \text{ yards}}{4{,}377{,}600 \text{ picks per loom in 6 weeks}} = 59.2, \text{ say 60 looms}$$

Weaver's Wages

Some cotton mills pay their weavers on the basis of the "cut" of so many yards, and a few pay on the basis of the pounds of cloth produced, but the prevailing practice in the United States is to pay on the basis of a certain number of picks, most usually 100,000 although in some cases 1,000 and in others 1,000,000. Practically all modern looms are equipped with pick counters.

To find weekly wages of a weaver on a particular cloth at piecework rates based on a certain number of picks:

RULE 60: *Divide total number of picks woven per week by the number of picks used as a basis and multiply the quotient by the piecework rate.*

EXAMPLE: A weaver tends 80 looms (40-inch automatics) on printcloth made 38½ inches, 5.35 yds. per lb., 64x60, of 30s warp and 40s filling; loom speed 166 picks per minute and efficiency 95%. Weaver is paid at rate of 14 cents per 100,000 picks. How much does he make in a 40-hour week?

ANSWER: (See Rule 57). The weaver produces per week $166 \times 60 \times 40 \times .95 = 378{,}480$ picks per loom, times 80 looms = 30,278,400 picks total; this number divided by 100,000 and the quotient multiplied by \$0.14 gives weaver's weekly wages as \$42.39.

To find weekly wages of a weaver on a particular cloth at piecework rates per cut of so many yards:

RULE 61: *Multiply total cuts produced by rate of payment per cut.*

EXAMPLE: Same as above except that the weaver is paid 18 cents per cut of 60 yards. How much does he make in a 40-hour week?

ANSWER: (See Rule 51). The weaver produces per week

$$\frac{166 \times 60 \times 40 \times .95}{60 \times 36 \times 60} = \frac{378{,}480 \text{ picks per loom}}{129{,}600 \text{ picks per cut}} = 2.92 \text{ cuts per}$$

loom, times 80 looms = 233.6 cuts total. At 18 cents per cut he makes $233.6 \times \$0.18 = \$42.05$ per week.

To find weekly wages of a weaver on a particular cloth at piecework rates per pound of cloth produced:

RULE 62: *Multiply total pounds of cloth produced by rate of payment per pound.*

EXAMPLE: Same as above except that the weaver is paid 1.6 cents per pound of cloth produced. How much does he make in a 40-hour week?

ANSWER: (See Rule 55). The weaver produces per week

$$\frac{166 \times 60 \times 40 \times .95}{60 \times 36 \times 5.35} = \frac{378{,}480 \text{ picks per loom}}{11{,}556 \text{ picks per pound}} = 32.75 \text{ pounds}$$

cloth per loom, times 80 looms = 2,620 pounds total. At 1.6 cents per pound he makes 2,620 × $0.016 = $41.92 per week.

NOTE—The weaver in the examples given above produces per week 14,017 yards or 2,620 pounds of printcloth containing 30,-278,400 picks of filling. Using 1 1/16-inch middling cotton in both warp and filling and allowing for 14% waste there is required 1 divided by .86, or 1.1628 pounds of cotton per pound of yarn. With 10% sizing retained on the warp the cloth contains about 55% warp yarn, 5.5% sizing, and 39.5% filling yarn, therefore the yarn constitutes 94.5% of the cloth weight. 2,620 × .945 = 2,476 pounds of yarn. 2,476 × 1.1628 = 2,879 pounds of lint cotton required per week. This is equivalent to about 6 bales of cotton (of 500 lbs. gross or 478 lbs. net weight).

To find rate of payment on a new cloth to give the weaver the same wages per week as before:

RULE 63: *Ascertain the output (in terms of cuts, pounds, or specified number of picks) obtainable on the new cloth and divide into former wages per week.*

EXAMPLE: A weaver tending 80 looms on 64x60, 5.35-yard printcloth (carded) is paid 14 cents per 100,000 picks and makes $42.39 a week. It is proposed to give him 28 looms on 4-harness Army uniform twill (combed) made 42½ inches, 1.68 yds. per lb., 107x58, of 36/2-ply warp and 24/2-ply filling. If the looms are to be run 170 picks per minute, with an expected efficiency of 85%, how much will he have to be paid per 100,000 picks to give him approximately the same weekly return?

ANSWER: (See Rule 57). The output per week to be expected from the weaver on the new cloth would be 170 × 60 × 40 × .85 = 346,800 picks per loom, times 28 looms = 9,710,400 picks total. This is equivalent to 97.1 payment units of 100,000 picks each. Dividing $42.39 by 97.1 gives 43.7 cents per 100,000 picks as rate to be paid on the Army twill.

NOTE—The weaver in the example given above produces per week 4,650 yards or 2,768 pounds of Army twill containing 9,710,-400 picks of filling. Using 1 3/16-inch strict middling cotton in

both warp and filling and allowing for 30% waste there is required 1 divided by .70, or 1.4285 pounds of cotton per pound of yarn . With 4½% sizing retained on the warp the cloth contains about 55.8% warp yarn, 2.5% sizing, and 41.7% filling yarn, therefore the yarn constitutes 97.5% of the cloth weight. 2,768 × .975 = 2,698 pounds of yarn. 2,698 × 1.4285 = 3,854 pounds of lint cotton required per week. This is equivalent to about 8 bales of cotton (of 500 lbs. gross or 478 lbs. net weight).

To find cost of weaver per loom per week:

RULE 64: *Divide weekly wages of weaver by number of looms operated.*

EXAMPLE: A weaver tending 80 looms on printcloth and a weaver tending 28 looms on Army twill both average about $42.39 a week. What is weekly weaving wage cost per loom?

ANSWER: The weekly weaving wage cost will be $42.39 divided by 80, or $0.53 per loom on the printcloth, and $42.39 divided by 28, or $1.514 per loom on the Army twill.

Table 2

Yards of cloth per loom per hour

(100% Production)

Picks Per Inch	Picks Per Minute										
	100	105	110	115	120	125	130	135	140	145	150
20	8.33	8.75	9.17	9.58	10.00	10.42	10.83	11.25	11.67	12.08	12.50
22	7.58	7.95	8.33	8.71	9.09	9.47	9.85	10.23	10.61	10.98	11.36
24	6.94	7.29	7.64	7.99	8.33	8.68	9.03	9.37	9.72	10.07	10.42
26	6.41	6.73	7.05	7.37	7.69	8.01	8.33	8.65	8.97	9.29	9.62
28	5.95	6.25	6.55	6.85	7.14	7.44	7.74	8.04	8.33	8.63	8.93
30	5.56	5.83	6.11	6.39	6.67	6.94	7.22	7.50	7.78	8.06	8.33
32	5.21	5.47	5.73	5.99	6.25	6.51	6.77	7.03	7.29	7.55	7.81
34	4.90	5.15	5.39	5.64	5.88	6.13	6.37	6.62	6.86	7.11	7.35
36	4.63	4.86	5.09	5.32	5.56	5.79	6.02	6.25	6.48	6.71	6.94
38	4.39	4.61	4.82	5.04	5.26	5.48	5.70	5.92	6.14	6.36	6.58
40	4.17	4.37	4.58	4.79	5.00	5.21	5.42	5.63	5.83	6.04	6.25
42	3.97	4.17	4.37	4.56	4.76	4.96	5.16	5.36	5.56	5.75	5.95
44	3.79	3.98	4.17	4.36	4.55	4.73	4.92	5.11	5.30	5.49	5.68
46	3.62	3.80	3.99	4.17	4.35	4.53	4.71	4.89	5.07	5.25	5.43
48	3.47	3.65	3.82	3.99	4.17	4.34	4.51	4.69	4.86	5.03	5.21
50	3.33	3.50	3.67	3.83	4.00	4.17	4.33	4.50	4.67	4.83	5.00
52	3.21	3.37	3.53	3.69	3.85	4.01	4.17	4.33	4.49	4.65	4.81
54	3.09	3.24	3.40	3.55	3.70	3.86	4.01	4.17	4.32	4.48	4.63
56	2.98	3.13	3.27	3.42	3.57	3.72	3.87	4.02	4.17	4.32	4.46
58	2.87	3.02	3.16	3.30	3.45	3.59	3.74	3.88	4.02	4.17	4.31
60	2.78	2.92	3.06	3.19	3.33	3.47	3.61	3.75	3.89	4.03	4.17
62	2.69	2.82	2.96	3.09	3.23	3.36	3.49	3.63	3.76	3.90	4.03
64	2.60	2.73	2.86	2.99	3.13	3.26	3.39	3.52	3.65	3.78	3.91
66	2.53	2.65	2.78	2.90	3.03	3.16	3.28	3.41	3.54	3.66	3.79
68	2.45	2.57	2.70	2.82	2.94	3.06	3.19	3.31	3.43	3.55	3.68
70	2.38	2.50	2.62	2.74	2.86	2.98	3.10	3.21	3.33	3.45	3.57
72	2.31	2.43	2.55	2.66	2.78	2.89	3.01	3.13	3.24	3.36	3.47
74	2.25	2.36	2.48	2.59	2.70	2.82	2.93	3.04	3.15	3.27	3.38
76	2.19	2.30	2.41	2.52	2.63	2.74	2.85	2.96	3.07	3.18	3.29
78	2.14	2.24	2.35	2.46	2.56	2.67	2.78	2.88	2.99	3.10	3.21
80	2.08	2.19	2.29	2.40	2.50	2.60	2.71	2.81	2.92	3.02	3.13
82	2.03	2.13	2.24	2.34	2.44	2.54	2.64	2.74	2.85	2.95	3.05
84	1.98	2.08	2.18	2.28	2.38	2.48	2.58	2.68	2.78	2.88	2.98
86	1.94	2.03	2.13	2.23	2.33	2.42	2.52	2.62	2.71	2.81	2.91
88	1.89	1.99	2.08	2.18	2.27	2.37	2.46	2.56	2.65	2.75	2.84

Table 2

Yards of cloth per loom per hour

(100% Production)

Picks Per Inch	Picks Per Minute										
	155	160	165	170	175	180	185	190	195	200	205
20	12.92	13.33	13.75	14.17	14.58	15.00	15.42	15.83	16.25	16.67	17.08
22	11.74	12.12	12.50	12.88	13.26	13.64	14.02	14.39	14.77	15.15	15.53
24	10.76	11.11	11.46	11.81	12.15	12.50	12.85	13.19	13.54	13.89	14.24
26	9.94	10.26	10.58	10.90	11.22	11.54	11.86	12.18	12.50	12.82	13.14
28	9.23	9.52	9.82	10.12	10.42	10.71	11.01	11.31	11.61	11.90	12.20
30	8.61	8.89	9.17	9.44	9.72	10.00	10.28	10.55	10.83	11.11	11.39
32	8.07	8.33	8.59	8.85	9.11	9.37	9.64	9.90	10.16	10.42	10.68
34	7.60	7.84	8.09	8.33	8.58	8.82	9.07	9.31	9.56	9.80	10.05
36	7.18	7.41	7.64	7.87	8.10	8.33	8.56	8.80	9.03	9.26	9.49
38	6.80	7.02	7.24	7.46	7.68	7.89	8.11	8.33	8.55	8.77	8.99
40	6.46	6.67	6.87	7.08	7.29	7.50	7.71	7.92	8.13	8.33	8.54
42	6.15	6.35	6.55	6.75	6.94	7.14	7.34	7.54	7.74	7.94	8.13
44	5.87	6.06	6.25	6.44	6.63	6.82	7.01	7.20	7.39	7.58	7.77
46	5.62	5.80	5.98	6.16	6.34	6.52	6.70	6.88	7.07	7.25	7.43
48	5.38	5.56	5.73	5.90	6.08	6.25	6.42	6.60	6.77	6.94	7.12
50	5.17	5.33	5.50	5.67	5.83	6.00	6.17	6.33	6.50	6.67	6.83
52	4.97	5.13	5.29	5.45	5.61	5.77	5.93	6.09	6.25	6.41	6.57
54	4.78	4.94	5.09	5.25	5.40	5.56	5.71	5.86	6.02	6.17	6.33
56	4.61	4.76	4.91	5.06	5.21	5.36	5.51	5.65	5.80	5.95	6.10
58	4.45	4.60	4.74	4.88	5.03	5.17	5.32	5.46	5.60	5.75	5.89
60	4.31	4.44	4.58	4.72	4.86	5.00	5.14	5.28	5.42	5.56	5.69
62	4.17	4.30	4.44	4.57	4.70	4.84	4.97	5.11	5.24	5.38	5.51
64	4.04	4.17	4.30	4.43	4.56	4.69	4.82	4.95	5.08	5.21	5.34
66	3.91	4.04	4.17	4.29	4.42	4.55	4.67	4.80	4.92	5.05	5.18
68	3.80	3.92	4.04	4.17	4.29	4.41	4.53	4.66	4.78	4.90	5.02
70	3.69	3.81	3.93	4.05	4.17	4.29	4.40	4.52	4.64	4.76	4.88
72	3.59	3.70	3.82	3.94	4.05	4.17	4.28	4.40	4.51	4.63	4.75
74	3.49	3.60	3.72	3.83	3.94	4.05	4.17	4.28	4.39	4.50	4.62
76	3.40	3.51	3.62	3.73	3.84	3.95	4.06	4.17	4.28	4.39	4.50
78	3.31	3.42	3.53	3.63	3.74	3.85	3.95	4.06	4.17	4.27	4.38
80	3.23	3.33	3.44	3.54	3.65	3.75	3.85	3.96	4.06	4.17	4.27
82	3.15	3.25	3.35	3.46	3.56	3.66	3.76	3.86	3.96	4.07	4.17
84	3.08	3.17	3.27	3.37	3.47	3.57	3.66	3.77	3.87	3.97	4.07
86	3.00	3.10	3.20	3.29	3.39	3.49	3.58	3.68	3.78	3.88	3.97
88	2.94	3.03	3.13	3.22	3.31	3.41	3.50	3.60	3.69	3.79	3.88

Table 2

Yards of cloth per loom per hour

(100% Production)

Picks Per Inch	Picks Per Minute										
	100	105	110	115	120	125	130	135	140	145	150
90	1.85	1.94	2.04	2.13	2.22	2.31	2.41	2.50	2.59	2.69	2.78
92	1.81	1.90	1.99	2.08	2.17	2.26	2.36	2.45	2.54	2.63	2.72
94	1.77	1.86	1.95	2.04	2.13	2.22	2.30	2.39	2.48	2.57	2.66
96	1.74	1.82	1.91	2.00	2.08	2.17	2.26	2.34	2.43	2.52	2.60
98	1.70	1.79	1.87	1.96	2.04	2.13	2.21	2.30	2.38	2.47	2.55
100	1.67	1.75	1.83	1.92	2.00	2.08	2.17	2.25	2.33	2.42	2.50
102	1.63	1.72	1.80	1.88	1.96	2.04	2.12	2.21	2.29	2.37	2.45
104	1.60	1.68	1.76	1.84	1.92	2.00	2.08	2.16	2.24	2.32	2.40
106	1.57	1.65	1.73	1.81	1.89	1.97	2.04	2.12	2.20	2.28	2.36
108	1.54	1.62	1.70	1.77	1.85	1.93	2.01	2.08	2.16	2.24	2.31
110	1.52	1.59	1.67	1.74	1.82	1.89	1.97	2.05	2.12	2.20	2.27
112	1.49	1.56	1.64	1.71	1.79	1.86	1.93	2.01	2.08	2.16	2.23
114	1.46	1.54	1.61	1.68	1.75	1.83	1.90	1.97	2.05	2.12	2.19
116	1.44	1.51	1.58	1.65	1.72	1.80	1.87	1.94	2.01	2.08	2.16
118	1.41	1.48	1.55	1.62	1.69	1.77	1.84	1.91	1.98	2.05	2.12
120	1.39	1.46	1.53	1.60	1.67	1.74	1.81	1.87	1.94	2.01	2.08
122	1.37	1.43	1.50	1.57	1.64	1.71	1.78	1.84	1.91	1.98	2.04
124	1.34	1.41	1.48	1.55	1.61	1.68	1.75	1.81	1.88	1.95	2.01
126	1.32	1.39	1.46	1.52	1.59	1.65	1.72	1.79	1.85	1.92	1.98
128	1.30	1.37	1.43	1.50	1.56	1.63	1.69	1.76	1.82	1.89	1.95
130	1.28	1.35	1.41	1.47	1.54	1.60	1.67	1.73	1.79	1.86	1.92
134	1.24	1.31	1.37	1.43	1.49	1.55	1.62	1.68	1.74	1.80	1.87
136	1.23	1.29	1.35	1.41	1.47	1.53	1.59	1.65	1.72	1.78	1.84
140	1.19	1.25	1.31	1.37	1.43	1.49	1.55	1.61	1.67	1.73	1.79
144	1.16	1.22	1.27	1.33	1.39	1.45	1.50	1.56	1.62	1.68	1.74
146	1.14	1.20	1.26	1.31	1.37	1.43	1.48	1.54	1.60	1.66	1.71
150	1.11	1.17	1.22	1.28	1.33	1.39	1.44	1.50	1.56	1.61	1.67
154	1.08	1.14	1.19	1.24	1.30	1.35	1.41	1.46	1.52	1.57	1.62
156	1.07	1.12	1.18	1.23	1.28	1.34	1.39	1.44	1.50	1.55	1.60
160	1.04	1.09	1.15	1.20	1.25	1.30	1.35	1.41	1.46	1.51	1.56
164	1.02	1.07	1.12	1.17	1.22	1.27	1.32	1.37	1.42	1.47	1.52
166	1.00	1.05	1.10	1.15	1.20	1.26	1.31	1.35	1.41	1.46	1.51
170	.98	1.03	1.08	1.13	1.18	1.23	1.27	1.32	1.37	1.42	1.47
174	.96	1.01	1.05	1.10	1.15	1.20	1.25	1.29	1.34	1.39	1.44
176	.95	.99	1.04	1.09	1.14	1.18	1.23	1.28	1.33	1.37	1.42
180	.93	.97	1.02	1.06	1.11	1.16	1.20	1.25	1.30	1.34	1.39

Table 2

Yards of cloth per loom per hour

(100% Production)

Picks Per Inch	Picks Per Minute										
	155	160	165	170	175	180	185	190	195	200	205
90	2.87	2.96	3.06	3.15	3.24	3.33	3.43	3.52	3.61	3.70	3.80
92	2.81	2.90	2.99	3.08	3.17	3.26	3.35	3.44	3.53	3.62	3.71
94	2.75	2.84	2.93	3.01	3.10	3.19	3.28	3.37	3.46	3.55	3.63
96	2.69	2.78	2.86	2.95	3.04	3.13	3.21	3.30	3.39	3.47	3.56
98	2.64	2.72	2.81	2.89	2.98	3.06	3.15	3.23	3.32	3.40	3.49
100	2.58	2.67	2.75	2.83	2.92	3.00	3.08	3.17	3.25	3.33	3.44
102	2.53	2.61	2.70	2.78	2.86	2.94	3.02	3.10	3.19	3.27	3.35
104	2.48	2.56	2.64	2.72	2.80	2.88	2.96	3.04	3.13	3.21	3.29
106	2.44	2.52	2.59	2.67	2.75	2.83	2.91	2.99	3.07	3.14	3.22
108	2.39	2.47	2.55	2.62	2.70	2.78	2.85	2.93	3.01	3.09	3.16
110	2.35	2.42	2.50	2.58	2.65	2.73	2.80	2.88	2.95	3.03	3.11
112	2.31	2.38	2.46	2.53	2.60	2.68	2.75	2.83	2.90	2.98	3.05
114	2.27	2.34	2.41	2.49	2.56	2.63	2.70	2.78	2.85	2.92	3.00
116	2.23	2.30	2.37	2.44	2.51	2.59	2.66	2.73	2.80	2.87	2.95
118	2.19	2.26	2.33	2.40	2.47	2.54	2.61	2.68	2.75	2.82	2.90
120	2.15	2.22	2.29	2.36	2.43	2.50	2.57	2.64	2.71	2.78	2.85
122	2.12	2.19	2.25	2.32	2.39	2.46	2.53	2.60	2.66	2.73	2.80
124	2.08	2.15	2.22	2.28	2.35	2.42	2.49	2.55	2.62	2.69	2.76
126	2.05	2.12	2.18	2.25	2.31	2.38	2.45	2.51	2.58	2.65	2.71
128	2.02	2.08	2.15	2.21	2.28	2.34	2.41	2.47	2.54	2.60	2.67
130	1.99	2.05	2.12	2.18	2.24	2.31	2.37	2.44	2.50	2.56	2.63
134	1.93	1.99	2.05	2.11	2.18	2.24	2.30	2.36	2.43	2.49	2.55
136	1.90	1.96	2.02	2.08	2.14	2.21	2.27	2.33	2.39	2.45	2.51
140	1.85	1.90	1.96	2.02	2.08	2.14	2.20	2.26	2.32	2.38	2.44
144	1.79	1.85	1.91	1.97	2.03	2.08	2.14	2.20	2.26	2.31	2.37
146	1.77	1.83	1.88	1.94	2.00	2.05	2.11	2.17	2.23	2.28	2.34
150	1.72	1.78	1.83	1.89	1.94	2.00	2.06	2.11	2.17	2.22	2.28
154	1.68	1.73	1.79	1.84	1.89	1.95	2.00	2.06	2.11	2.16	2.22
156	1.66	1.71	1.76	1.82	1.87	1.92	1.98	2.03	2.08	2.14	2.19
160	1.61	1.67	1.72	1.77	1.82	1.87	1.93	1.98	2.03	2.08	2.14
164	1.58	1.63	1.68	1.73	1.78	1.83	1.88	1.93	1.98	2.03	2.08
166	1.56	1.61	1.66	1.71	1.76	1.81	1.86	1.91	1.96	2.01	2.06
170	1.52	1.57	1.62	1.67	1.72	1.76	1.81	1.86	1.91	1.96	2.01
174	1.48	1.54	1.58	1.63	1.68	1.72	1.77	1.82	1.87	1.92	1.96
176	1.47	1.52	1.56	1.61	1.66	1.70	1.75	1.80	1.85	1.89	1.94
180	1.44	1.48	1.53	1.57	1.62	1.67	1.71	1.76	1.81	1.85	1.90

Unbleached single filling, unless rewound, usually goes direct from the spindle to the shuttle and the only waste made is that at the loom itself. Some mills condition their filling yarns with the result that not only does the work run better but more pounds of filling are woven than are spun. The warp undergoes several intermediate processes, such as winding, warping, slashing, and drawing in, and more or less waste is made at each process in addition to waste at the loom. In a large number of instances the sizing added at the slasher more than compensates for all warp waste between the spun yarn and the finished cloth. The weight of the cloth may therefore be more or it may be less than the weight of the yarns as spun for its manufacture. It is rare, however, that the percentages of warp yarn and of filling yarn in the woven cloth are exactly the same as the percentages of warp yarn and of filling yarn required from the spinning frame. In order to avoid an over or under supply of warp or of filling it is often of importance to know how to figure so as to insure an exact balance between spinning and weaving.

To find warp and filling required to be spun to fill a certain order:

Rule 65: *Ascertain weight of filling in cloth by Rule 35-a and divide by 1 minus percentage of filling waste to get weight of filling to be spun. Ascertain weight of unsized warp by Rule 36 and divide by 1 minus percentage warp waste to get weight of warp to be spun.*

Example: A mill receives an order for 100,000 yards (23,520 pounds) of 39-inch, 72x76, 4.25-yard print cloth, and makes it of 30s warp and 37s filling. Assuming 3% filling waste to be made at the loom and 5% warp waste to be made between the spun yarn and the woven cloth, how much warp and filling must be spun to fill this order?

Answer: As shown in the example given under Rules 35 and following, the woven cloth is composed of 52.47% warp yarn, 3.40% sizing, and 44.13% filling, therefore 100,000 yards of the cloth is composed of 12,340 pounds of warp yarn and 10,380 pounds of filling yarn in addition to 800 pounds of sizing.

The warp required from the spinning frame will be 12,340 divided by 1 minus 5% waste, or .95, which is 12,990 pounds. The filling required from the spinning frame will be 10,380 divided by 1 minus 3% waste, or .97, which is 10,700 pounds. Therefore to make 100,000 yards of cloth, containing 22,720 pounds of actual

yarn, there is required 23,690 pounds of yarn from the spinning frames. In percentages we find:

Warp (sized) = 55.87% of cloth weight.
Warp (unsized) = 52.47% of cloth weight.
Warp (unsized) = 54.31% of actual yarn in cloth.
Warp (unsized) = 54.83% of actual yarn spun.
Filling = 44.13% of cloth weight.
Filling = 45.69% of actual yarn in cloth.
Filling = 45.17% of actual yarn spun.

Length Cloth That Can Be Woven With a Given Amount of Warp or Filling

To find length of cloth that can be woven with a warp of known weight and count:

Rule 66: *Multiply net weight of warp on loom beam by 1 minus percentage of sizing on warp, by warp yarn number, by 840, by 1 minus warp contraction in weaving, and by 1 minus percentage of loss in weight of warp at loom; divide product by total ends in warp.*

Example: A loom beam with 2832 ends of 30s is found to weigh 145 pounds net. It is known to carry 7% sizing. How many yards of 39-inch, 72x76, 4.25-yard printcloth can be made therewith?

Answer: Sizing equals 7%. 1 — .07 = .93. From the table given for contraction in weaving plain cloths the warp contraction is found to be 8.95%. 1 — .0895 = .9105. The loss in weight of warp at loom, including sizing shaken or chafed off as well as warp yarn wasted at the beginning and ending of the weaving, may be estimated in this case at 1%. 1 — 1% = .99. Then the yards of cloth that can be woven from this warp =

$$\frac{145 \times .93 \times 30 \times 840 \times .9105 \times .99}{2832} = 1082 \text{ yards or 18 cuts}$$

of 60 yards each.

To find length of cloth that can be woven with filling of known weight and yarn number:

Rule 67: *Multiply weight of filling by yarn number and by 840, also by 1 minus percentage of filling waste at loom; divide product by picks per inch and by width warp in reed.*

Example: A 76-pick cloth that is spaced 42.46 inches wide in the reed is using 37s filling. There are 116 pounds of filling on

hand. Assuming a filling waste at the loom of 3%, what length of cloth can be woven therewith?

$$\text{Answer: } \frac{116 \times 37 \times 840 \times .97}{76 \times 42.46} = 1083 \text{ yards.}$$

Note—This is a useful rule in ascertaining if the filling on hand is sufficient to complete an order calling for a certain number of yards. If it is not sufficient, then the additional amount of filling required for the remaining yardage can be ascertained by the use of Rule 35, with due allowance for probable waste at loom.

Loom Speeds

Narrow looms are operated faster than wide looms, for instance a loom on 36-inch sheeting will ordinarily be speeded to put in about twice as many picks per minute as a loom on 108-inch sheeting. This does not necessarily mean that the shuttle itself travels faster, for in fact in the instance cited the shuttle in the narrow loom will not cover as many feet per second as the shuttle in the wide loom. In an advertisement a few years ago the Draper Corporation stated that with its 40-inch loom running 192 picks per minute the shuttle had a velocity of 38 feet per second (equivalent to 25.9 miles per hour), and that with its 90-inch loom running 120 picks per minute the shuttle had a velocity of 42 feet per second (equivalent to 28.6 miles per hour). The shuttle works intermittently, coming to a full stop at the end of each pick, so the actual miles covered by the shuttle in an hour is less than half of the average miles per hour while in flight. For instance, in the case of the 40-inch loom above, taking the "throw" of the 16½-inch shuttle, that is the distance covered by it each pick, to be 69½ inches, the total distance covered by it in an hour is 69½ (inches) times 192 (picks per minute) times 60 (minutes in an hour), divided by 12 (inches per foot) and by 5,280 (feet per mile), or 12.6 miles. In the case of the 90-inch loom, taking the throw of the 18½-inch shuttle to be 123½ inches, the total distance covered by it in an hour is 123½ × 120 × 60, divided by 12 × 5,280, or 14.0 miles. The foregoing indicates that in a 40-hour week the shuttle is active less than 19 hours even though the loom may be in operation up to 38 hours.

One of the widest looms in the United States weaves felt cloths up to 550 inches in width for use as pulp-conveyor belts on paper-making machines. The 23-inch shuttle makes 32 picks per minute. With a throw of 594 inches, the distance covered by the shuttle in an hour is 594 × 32 × 60, divided by 32 × 5,280, or 18.0 miles. The average velocity of the shuttle in flight is apparently more than 36 miles per hour.

One of the widest looms ever made was built by a textile-machinery firm at Chemnitz, Germany, in 1926 to weave heavy felt

cloths, for mechanical purposes, up to 23 meters or 905½ inches in width. The 29½-inch shuttle (made of sheet steel and weighing about 20 pounds) made 11 picks per minute; its velocity was stated as 10 meters per second (equivalent to about 22.4 miles per hour). Estimating the throw of the shuttle as 960 inches, the distance covered by it in an hour would be 960 × 11 × 60, divided by 12 × 5,280, or 10.0 miles.

The fact that the shuttle efficiency is so much less than the loom efficiency has led to attempts to produce a circular loom in which shuttle and loom efficiency will be the same, and to attempts to produce a so-called shuttleless loom. A Swiss loom of the latter type is now (1948) being perfected by an American firm for mass production.

Although in general the wider the loom the slower its speed in picks per minute, width is only one of several factors that have to be considered in deciding on the speed at which looms are to be operated; among others are the type of goods, the type of loom, the strength of the yarn, the skill of the weaver and the number of looms per weaver. For some purposes cloth is required as near perfect as possible and in such cases the loom speed is reduced appreciably or else fewer looms given the weaver. Box looms have to be operated slower than similar looms without boxes. Looms making fancy fabrics with the aid of dobby or Jacquard attachments are also operated at reduced speeds. Even on looms of the same type making identical goods from identical material there is variation from mill to mill in the number of picks per minute. The best speed is usually that which gives the lowest weaving cost, and generally this is not the highest speed attainable.

Most American cotton looms are operated at speeds lower than those usual in many foreign countries. It is axiomatic that in a high-wage country the main objective is maximum production per operative while in a low-wage country the main objective is maximum production per machine. United States mills, paying the highest wages in the world, therefore give each weaver as many looms as he can handle; this has meant that the light automatic looms have had to be operated at moderate speeds. Recently, however, there have been perfected much heavier looms which can be operated, without reduction of the number per weaver, at speeds as high as any used abroad. Whereas on staple printcloths, for instance, the American weaver has been operating 50 to 100 looms at 160 to 165 picks per minute, it is probable that in the future he will operate 100 looms at more than 200 picks per minute.

The British are accustomed to high loom speeds. For instance,

they have for many years operated their heavy, non-automatic "40-inch calico looms" at 200 to 220 picks per minute. As a rule the British weaver is required to do much extra work, such as battery filling and cloth carrying, and cleaning, oiling, and sweeping, that in the United States is done by cheaper auxiliary workers. The British mills generally use cotton of a somewhat shorter staple and lower grade than would be used by American mills for the same fabrics, and their yarns are weaker as they use warp and filling twist factors of 4.00 and 3.50 against the 4.75 and 3.75 customary here. Under these conditions it is not surprising that the highly skilled British weaver runs only 4 to 6 looms. Less than 5 per cent of the British looms are automatic and on these the usual assignment is only about 20 looms per weaver. Whereas the average American mill is devoted to mass production of a limited number of staple fabrics, the average British mill, catering to world markets, makes short runs of a large variety of fabrics. This fact, together with the expressed preference of the British workers to weave "by the yard, not the acre," and the great amount of money that would be required for the change, militate against any early replacement of non-automatic by automatic looms in the United Kingdom.

The Japanese cotton industry (now small in relation to its prewar status) is also accustomed to operate its power-driven looms at high speeds. In the small weaving mills operating non-automatic looms on inferior material (mostly short Indian and Chinese cotton) many weavers run only two or three looms. The large spinning and weaving mills, however, in attempting after World War I to extend their export trade to Western countries by making fabrics requiring better and therefore more costly cotton of the American or Egyptian types, found it advisable to supplement their low-wage advantage by adoption of the automatic loom. In the 1930s Japan had more automatic looms than any country other than the United States and it supplanted the United Kingdom as the world's largest exporter of cotton cloth. In some of these mills making 36- to 40-inch plain woven mulls and shirtings from about 40s yarns individual girl weavers were operating, even before 1936, 25 to 30 Toyoda automatic shuttle-changing looms at 210 picks per minute.

Of some 500,000 looms in the cotton and rayon mills of the United States over 95 per cent are automatic. The 40-inch loom accounts for over 40 per cent of the total looms, and for over 50 per cent of the plain one-shuttle automatics. Other principal widths are 36, 44, 42, and 54-inch in the order named.

The loom requirements of American cotton mills are supplied

almost entirely by two textile-machinery firms, one of which makes plain one-shuttle automatic bobbin-changing looms and the other makes box looms of both the bobbin-changing and shuttle-changing types.

The following table shows the speeds in picks per minute, for looms on medium weight cloths, which were recommended in a Draper catalog published in 1917:

Cloth width in inches	Picks per minute	Cloth width in inches	Picks per minute
28	185 to 190	64	124 to 128
30	180 to 185	68	120 to 124
32	175 to 180	72	116 to 120
34	170 to 175	76	112 to 116
36	165 to 170	80	108 to 112
38	163 to 168	84	104 to 108
40	160 to 165	88	100 to 104
42	154 to 158	90	100 to 104
44	148 to 152	96	96 to 100
46	144 to 148	100	92 to 96
48	140 to 144	104	90 to 94
52	136 to 140	108	88 to 92
56	132 to 136	110	86 to 90
60	128 to 132		

In spite of its age this table seems worth reproducing as affording some indication of the relation of loom speeds to widths. It is interesting to note that in 1948 the bulk of the 40-inch looms, on printcloths at least, are operated at 160 to 165 picks per minute, the speed recommended in 1917. In answer to a recent inquiry the Draper Corporation wrote that it wou'd not attempt to revise this table, because there are so many variables and so much depends on the particular type of fabric being woven. It forwarded a catalog of its present "X" series of looms which, due to various improvements and particularly to the reduction of vibration by adding weight to the loom frame, can be operated at much higher speeds than Draper looms of older models. The catalog states that the X-2 model, introduced in 1941, can be run on 40-inch printcloth at from 202 to 224 picks per minute, 100 looms to the weaver.

The Crompton & Knowles Loom Works states that it builds so many different kinds of looms it is difficult to generalize but the following speeds in picks per minute may be taken as representative for its automatic box looms:

Cloth width in inches	Picks per minute
30, 32, and 36	172 to 182
50 and 54	162 to 172
60	152
72	142
82	134
92	128
120	107

On the basis of data from a large number of American cotton mills, the actual loom speeds (and the looms per weaver) most customary in 1941-44 on some representative cotton cloths were as follows:

No. 2 duck, 22″—122 picks per minute (6 looms per weaver); No. 2 duck, 36″—98 (4 looms); No. 8 duck, 22″—140 (18 looms); No. 8 duck, 36″—130 (18 looms); No. 10 duck, 36″—144 (16 looms); No. 10 duck, 72″—89 (4 looms).

Army duck, 28½″ to 30½″—140 to 160 (25 to 36 looms).

Single or double filling duck, 29″, 8 oz.—150 to 172 (22 to 28 looms).

Osnaburgs, 30″, 2.00 to 2.28 yds. per lb.—154 to 172 (28 to 40 looms).

Drills, 30″, 72x48—160 to 168 (40 to 50 looms).

Sheetings, 36″ and 40″—150 to 168 (mostly 32 to 72, some 112, looms).

Wide sheetings: 54″—126 to 140 (26 to 50 looms); 63″—124 to 130 (24 to 48 looms); 72″—116 to 123 (20 to 44 looms); 81″—108 to 123 (16 to 41 looms); 90″—100 to 121 (16 to 38 looms); 99″—94 to 100 (16 to 35 looms); 108″—88 to 92 (12 to 32 looms).

Note—Indicative of the wide range from mill to mill is the fact that four mills making 81″, 64x64 sheeting of closely similar weights showed: (a) 110 picks per minute (34 looms per weaver); (b) 112 picks (16 looms); (c) 112 picks (41 looms); (d) 114 picks (21 looms).

Cheesecloths, 36″—160 to 172 (60 to 153 looms).
Printcloths, 25″ to 28″—168 to 180 (52 to 104 looms).
Printcloths, 38½″ and 39″—154 to 170 (50 to 100 looms).
Printcloths, 45″—140 to 160 (41 to 74 looms).
Carded broadcloths—154 to 176 (32 to 76 looms).
Combed broadcloths—150 to 170 (10 to 30 looms).

Combed lawns, 40″, 88x80 —155 to 170 (24 to 64 looms).
40″, 96x100—150 to 165 (24 to 54 looms).
45″, 88x80 —140 to 155 (24 to 40 looms).
Combed voiles, 39″, 60x52 —155 to 165 (24 to 60 looms).
Plain marquisettes, 39½″—140 to 150 (16 looms).
Clipped-spot marquisettes, 46″—130 to 144 (8 to 16 looms).
Army uniform twills (ply yarns), 40″ to 44½″—150 to 180 (22 to 32 looms).

Denims and denim stripes, 28½″ to 30″—170 to 185 (mostly 32 looms).

NOTE—The foregoing data relate to cloths made on the Model E and similar looms which constituted the bulk of those used in the mills studied. A relatively small number of the looms in these mills were of the Model X type; these were operated at 182 to 206 picks per minute.

During World War II the standard printcloth, 38½″, 64x60, 5.35 yards per pound, was ordered changed to 38½″, 64x56, 5.50 yards per pound. The new construction was made in huge quantities. Some details of its manufacture in a number of mills are shown below.

Printcloth, 38½ inches wide, 64x56, 5.50 yards per pound: Details of production by 24 cotton mills in 1944[1]

Mill	Cotton used	Yarns	Looms per weaver	Picks per minute	Loom efficiency	Yards cloth per weaver per week
1	$\frac{15}{16}$″	30s-40s	26	154	90%	4,290
2	$1\frac{1}{32}$″	31s-43s	82	156	98%	14,924
3	$1\frac{1}{16}$″	30½s-39½s	64	158	90%	10,834
4	1″	31.7s-42s	68	158	86%	11,000
5	$1\frac{1}{16}$″	30s-40s	30	160	88%	5,029
6	$1\frac{1}{16}$″	31s-42s	54	160	95%	9,771
7	$1\frac{1}{16}$″	30s-40s	60	160	90%	10,286
8	$1\frac{1}{16}$″	31s-42s	60	160	95%	10,857
9	$1\frac{1}{16}$″	31s-40s	64	160	91%	11,093
10	$1\frac{1}{16}$″	30s-42s	66	160	95%	11,943
11	$1\frac{1}{32}$″	31s-42s	68	160	96%	12,434
12	$1\frac{1}{16}$″	31s-38s	72	160	93%	12,754
13	$1\frac{1}{16}$″	31s-41½s	72	160	94%	12,891
14	$1\frac{1}{16}$″	31s-40s	72	160	96%	13,166
15	$1\frac{1}{16}$″	30s-40s	74	160	95%	13,390
16	$1\frac{3}{32}$″	30s-40s	92	160	93%	16,297
17	$1\frac{1}{16}$″	31s-40s	70	163	91%	12,361
18	$1\frac{1}{16}$″	30½s-42.9s	78	165	93%	14,249
19	$1\frac{1}{32}$″	30s-40s	80	165	96%	15,086

20a	$1\frac{1}{16}''$	30½s-41s	80	165	89%	13,986
21	$1\frac{1}{16}''$	30s-42s	80	165	98%	15,400
22	$1\frac{1}{32}''$	30½s-39¼s	85	165	99%	16,529
23	[2]$1\frac{3}{32}''$	31s-42s	33	182	84%	6,006
24	$1\frac{1}{32}''$	30s-42½s	80	194	92%	16,998
20b	$1\frac{1}{16}''$	30½s-41s	80	206	87%	17,069

1. Mills 23 and 24 used Model X looms; mill 20 used both E and X looms; all of the other mills shown used only Model E looms. Mill 1 made cloth for small bags and mills 5 and 23 made shadecloth.

2. Mill 23 used $1\frac{3}{32}''$ and 1⅛″ cotton, mixed half and half, in both warp and filling.

Transmission Problems

In stating rules for loom speed calculations most writers disregard the fact that there is such a thing as belt slippage, with the result that there is not actually obtained the speed calculated. The percentage of speed lost by belt slippage varies according to conditions but, with proper care given the belts, will be around 3% for each belt and it is well to allow for this amount. If there are two belts between the main shaft and the loom and each slips 3%, a total of approximately 6% of the speed is thus lost. This means a loss of 8 to 12 picks per minute at the loom and belt slippage is therefore an appreciable item in most calculations dealing with the transmission of power by belting.

To find speed of loom, when speed of shafting, diameter of driving pulley, and diameter of loom pulley are known:

RULE 68: *Multiply speed of shafting by diameter of driving pulley, and by 1 minus percentage of belt slip; divide product by diameter of loom pulley.*

EXAMPLE: Shafting is run at 325 r. p. m. (revolutions per minute), with a 7-inch pulley driving down to a 14-inch pulley on loom. What is speed of loom if 3% is allowed for belt slippage?

$$\text{ANSWER: } \frac{325 \times 7 \times .97}{14} = 157\tfrac{1}{2} \text{ picks per minute.}$$

To find speed of shafting, when diameter of driving pulley, diameter of loom pulley, and speed of loom are known:

RULE 69: *Multiply speed of loom by diameter of loom pulley; divide product by diameter of driving pulley, and by 1 minus percentage of belt slip.*

EXAMPLE: With driving pulley of 7 inches diameter and loom pulley of 14 inches diameter, what would be speed of shafting required to give 157½ picks per minute if belt slip be taken as 3%?

$$\text{ANSWER: } \frac{157.5 \times 14}{7 \times .97} = 325 \text{ r. p. m. of shafting.}$$

To find diameter of driving pulley, when speed of shafting, speed of loom, and diameter of loom pulleys are known:

RULE 70: *Multiply speed of loom by diameter of loom pulley, divide product by speed of shafting, and by 1 minus percentage of belt slip.*

EXAMPLE: Shafting runs 325 r. p. m., and loom has 14-inch pulley. If belt slip be taken as 3%, what is diameter of driving pulley required to give 157½ picks per minute?

ANSWER: $\frac{157.5 \times 14}{325 \times .97} = 7$ inches diameter of driving pulley.

To find diameter of loom pulley, when speed of loom, speed of shafting, and diameter of driving pulley are known:

RULE 71: *Multiply speed of shafting by diameter of driving pulley, and by 1 minus percentage of belt slip; divide product by speed of loom.*

EXAMPLE: Shafting runs at 325 r. p. m. and drives loom from a 7-inch pulley on shaft. Allowing for 3% belt slip, what is diameter of loom pulley required to give 157½ picks per minute?

ANSWER: $\frac{325 \times 7 \times .97}{157.5} = 14$ inches diameter of loom pulley.

To find diameter of loom pulley required in changing speed of loom, knowing diameter of loom pulley in use:

RULE 72: *Multiply present speed of loom by diameter of present loom pulley; divide product by loom speed desired.*

EXAMPLE: Loom is being run at 157½ picks per minute with 14-inch loom pulley; what loom pulley would be required to speed loom up to 165 picks per minute?

ANSWER: $\frac{157.5 \times 14}{165} = 13.36$ inches diameter loom pulley.

NOTE—Loom pulleys are normally made only in full inch diameters such as 10, 11, 12, 13, 14, 15, or 16 inches and where the above rule does not give an answer very close to the even inch it is necessary to change also some other pulley between the main shaft and the loom. Where a countershaft is employed it is usually preferable to change the pulleys carrying the countershaft belt but any one or all of the four pulleys between the main shaft and the loom may be changed if circumstances warrant.

To find diameters of pulleys required to change speed of loom, knowing present speeds and diameters of pulleys being used:

RULE 73: *Divide speed of loom required by present speed of loom to ascertain percentage of change in speed required. Change one or more pulleys until product of driving pulleys divided by product of driven pulleys is changed to the extent of the percentage of change in loom speed desired.*

NOTE—The pulley on main shaft and every alternate pulley in the drive are driving pulleys; the pulley driven by main shaft and every alternate pulley are considered as driven pulleys.

EXAMPLE: Main line shafting runs at 300 r. p. m., using a 30-inch pulley to drive to a 27-inch pulley on countershaft. The countershaft has a 7-inch pulley driving down to a 14-inch pulley on loom. Present speed of loom is 157½ picks per minute. What changes should be made to obtain a loom speed of 165 picks per minute?

ANSWER: The proposed loom speed of 165, divided by the present loom speed of 157½ picks per minute, equals 1.0475, showing that the speed is to be increased by 4¾%. Present arrangement of pulley is $\frac{30 \times 7}{27 \times 14}$. If it were possible to increase diameter of any one driving pulley by 4¾%, or decrease diameter of any driven pulley by 4¾%, and get a pulley of commercial size, that would be the easiest arrangement. The change in diameter is, however, too small to make that practicable so it is necessary to try various combinations until we strike one where the product of the diameters of the driving pulleys divided by the product of the diameters of the driven pulleys is 4¾% more than that of the result of the present arrangement. In trying to make the change with two new pulleys only we may divide the main shaft pulley diameter (30 inches) times 1.0475 by the diameter of the countershaft receiving pulley (27 inches). This gives 1.162. Dividing a trial number 28 by a trial number 24 we get 1.166, which is very nearly the same, so we may use a 28-inch main shaft pulley and a 24-inch countershaft receiving pulley; in so doing we avoid changing either the countershaft driving pulley or the loom pulley.

PROOF:

$$\frac{300 \times 30 \times 7 \times .94}{27 \times 14} = 156.7 \text{ picks per minute present speed.}$$

$$\frac{300 \times 28 \times 7 \times .94}{24 \times 14} = 164.5 \text{ picks per minute required speed.}$$

To find difference in length of belt required when changing the size of one or both pulleys:

RULE 74: *Take the difference between the diameters of the pulleys, present and prospective, and one-half of the difference, and add to present belt length if the change is to pulleys the sum of whose diameters is larger than the sum of the diameters of the present pulleys, or subtract from present belt length if the sum of the diameters of the new pulleys is smaller than the sum of the diameters of the present pulleys.*

EXAMPLE 1: A loom pulley of 14 inches is substituted for a loom pulley of 12 inches. What length should be added to the loom belt?

ANSWER: $14 - 12 = 2$. $2 \times 1\frac{1}{2} = 3$ inches longer belt required.

EXAMPLE 2: A countershaft belt runs on pulleys of 30 and 27 inches diameter, but these are replaced by 28 and 24 inch pulleys. Should the countershaft belt be lengthened or shortened and by how much?

ANSWER: 30 plus 27 equals 57; 28 plus 24 equals 52. The difference is $57 - 52$ or 5 inches. $1\frac{1}{2} \times 5 = 7\frac{1}{2}$ inches, which is the amount that needs to be cut out of the belt.

TYPICAL AMERICAN COTTON CLOTHS

Typical American Cotton Cloths

A book on weave room calculations is hardly complete without some tabulation of cloths with their particulars. To be of the greatest practical value such tabulation should be comprehensive, should be arranged according to some logical system of classification, and should show for each cloth the full particulars, including not only the cloth width and weight and the construction but also the yarn numbers. The cotton weaving industry has many ramifications and the compilation of a list that will cover in detail every important class of fabric is necessarily a work of slow growth. The list here given, while not exhaustive, is the most comprehensive yet printed. It includes a substantial number of fine-yarn fabrics and of specialties, but most largely staple plain fabrics woven of coarse and medium yarns. The predominance of these latter in the list reflects actual conditions in the industry for the great majority of cotton goods are made of short-staple cottons, not exceeding $1\frac{1}{16}$ inches in length, whose spinning limit is not much above 40s.

The data shown in this list have been collected from various sources. Part were furnished by the mills, part were copied from reports (printed or unprinted) of official investigations, part were taken from textile publications, and part were obtained by analysis of samples. In a limited number of instances the yarns corresponding to published constructions have been figured by the author and their correctness checked by comparison with the nearest similar fabrics reported by the mills. The intent has been to use actual rather than nominal particulars and first hand verification was obtained whenever possible. In the case of any particular fabric, of course, the yarns used may vary within limits according to the percentage of sizing, the number of extra ends in the selvages, and other causes. For a few individual fabrics of large production, such as the 5.35-yard printcloth, there are listed a number of yarn combinations, each from a separate mill. Where only one yarn combination is given for a fabric it is therefore advisable to regard it as merely indicative and to study the yarn combinations given for other fabrics of analagous character before attempting reproduction.

A comprehensive and logically classified list of cotton cloths with full particulars, including yarn numbers, should prove of considerable suggestive value to makers and dealers. Incidentally, the list given in the second edition was found useful by Government agencies in their price-fixing and other control operations during World War II. This cross-section, incomplete though it may be, of the output of American cotton cloth mills tends to show the advisability if not the necessity of standardization, of a reduction in the number of fabrics produced, and of research work as to the yarn combination that is best for each construction in relation to the intended use of the fabric.

In this third edition the number of cotton cloths, considering each yarn combination as that of a separate cloth, has been increased from about 3,200 to more than 4,200; the thousand or so additional cloths include a number that were developed or first made in quantity during the second world war. Part 1 covers cloths woven of unbleached yarns and Part 2 covers cloths woven in whole or in part of dyed yarns. Part 1 has been subdivided into sections. Section A relates to plainwoven cloths; Section B to special plainwoven cloths; Section C to twills and sateens; Section D to special cloths other than plainwoven; Section E to duck fabrics; and Section F to tire fabrics.

Section A—Plainwoven cotton cloths in the gray—constitutes the largest group and for this reason is classified in more detail than are the other sections. The basis of the classification here used is the effective yards of yarn per pound of cloth, represented by "BYT," as follows:

BYT	Group name used
Up to 6,000	Osnaburgs (6s range)
6,001 to 9,000	Osnaburgs (10s range)
9,001 to 12,000	Coarse sheetings (14s range)
12,001 to 15,000	Coarse sheetings (18s range)
15,001 to 18,000	Sheetings (22s range)
18,001 to 21,000	Sheetings (26s range)
21,001 to 30,000	Cheesecloths (less than 100 threads per square inch.)
21,001 to 30,000	Printcloths (100 or more threads per square inch.)
30,001 to 40,000	Medium-fine plains (warp mainly 40s)
40,001 to 50,000	Medium-fine plains (warp mainly 50s)
50,001 to 60,000	Fine plains (warp mainly 60s)

60,001 to 80,000	Fine plains (warp mainly 80s)
80,001 to 100,000	Extra-fine plains (warp mainly 100s)
100,001 to 120,000	Extra-fine plains (warp mainly 120s)

Therefore to locate any ordinary plainwoven gray cloth, multiply B (the width in inches) by Y (the yards per pound) and by T (the single threads per square inch) to obtain the BYT or effective yards of yarn per pound of cloth; if the fabric is given in the list it will be found under the group name shown above as corresponding to the range in which the particular BYT falls. It has been deemed advisable to use this system of classification, which is practically the same as classification according to average yarn number, and to omit such terms as nainsook, India linon, organdie, etc., which indicate finishes and are therefore not applicable to the unbleached fabrics.

The symbols used for the various cloth particulars listed are as follows:

B = Breadth (width) in inches.
Y = Yards (linear) per pound.
E = Ends of warp per inch of cloth.
P = Picks of filling per inch of cloth.
W = Warp yarn number.
F = Filling yarn number.
Z = Ounces per linear yard.
Z′ = Ounces per square yard.

PART 1

COTTON CLOTHS WOVEN OF UNBLEACHED YARNS

Section A—PLAINWOVEN COTTON CLOTHS, IN THE GRAY

B	Y	E x P	W	F	BYT
		Osnaburgs (6s range)			
24	2.50	32x28	5.50s	5.50s	3,600
26½	2.50	44x28	8.25s	5.25s	4,770
28	2.28	30x30	5.50s	6s	3,830
28	2.28	42x28	7.50s	5s	4,469
29	2.66	29x29	6s	6.50s	4,474
29	2.90	30x32	8s	6.50s	5,214
29	3.33	30x30	8s	8s	5,794
29	3.33	32x30	8.50s	7.50s	5,987
30	1.78	38x32	5.50s	6s	3,738
30	2.00	32x28	6s	4.25s	3,600
30	2.00	32x32	5.50s	6s	3,840
30	2.00	36x30	5.75s	5.50s	3,960
30	2.00	36x31	6s	5.50s	4,020
30	2.00	39x30	7.50s	4.75s	4,140
30	2.00	39x34	8.50s	5s	4,380
30	2.00	40x30	8s	4.50s	4,200
30	2.00	42x30	6s	6s	4,320
30	2.28	30x30	6s	6s	4,104
30	2.28	32x28	6s	5.75s	4,104
30	2.28	36x30	6s	7s	4,514
30	2.28	38x30	8.50s	5s	4,651
30	2.28	39x30	8.50s	4.75s	4,720
30	2.28	40x28	6.75s	6.25s	4,651
30	2.28	40x30	8s	5.60s	4,788
”	”	”	8.50s	5.25s	4,788
30	2.28	40x31	6.75s	6.75s	4,856
30	2.28	42x30	6s	8s	4,925
30	2.28	42x32	6.75s	7.50s	5,062
30	2.35	32x28	5.75s	6.50s	4,230
30	2.35	40x28	8s	5.60s	4,794
31	2.80	32x30	8.50s	6.20s	5,382
31½	2.00	30x30	5.50s	6s	3,780
32	1.88	32x28	5.50s	5.50s	3,610
34	1.78	32x28	5.50s	5.50s	3,631

B	Y	E x P	W	F	BYT
		Osnaburgs (6s range) (Continued)			
34	2.34	39x28	8.50s	6.50s	5,331
36	1.77	40x28	8s	4.50s	4,333
36	1.90	40x30	8.50s	5.25s	4,788
36	2.28	40x28	7.50s	8.50s	5,581
36	2.30	32x24	8.50s	4.75s	4,637
36	2.35	40x26	9s	6.50s	5,584
36	2.35	40x28	9s	6.75s	5,753
36	2.50	24x24	6s	6s	4,320
36	2.50	32x30	8.50s	7s	5,580
36	3.30	24x20	9s	5.50s	5,227
37	2.50	26x22	7s	5.50s	4,440
37	3.00	26x22	9s	6s	5,328
38	3.85	24x16	9s	6.50s	5,852
38½	2.85	28x24	7.50s	8s	5,706
39	1.78	40x20	15s	2.50s	4,165
40	1.60	32x28	5.75s	5.50s	3,840
40	1.71	39x30	8.50s	4.75s	4,720
40	1.71	40x30	8s	5.60s	4,788
40	2.00	32x28	6s	7.50s	4,800
40	2.00	38x36	8.25s	8.25s	5,920
40	2.05	40x28	10s	5.70s	5,576
40	2.11	38x24	8s	6.50s	5,233
40	2.11	40x26	8s	7s	5,570
40	2.28	20x20	6s	4.50s	3,648
40	2.28	32x28	7s	8.50s	5,472
41	1.77	32x29	7s	5.50s	4,427
41½	2.23	32x29	7s	8s	5,645
52	1.35	40x20	15s	2.50s	4,212
54	1.75	34x28	8s	8.50s	5,859
54	1.75	35x25	8s	8s	5,670
60	1.33	32x28	8s	5.60s	4,788
72	1.17	40x26	9s	6.50s	5,560
		Osnaburgs (10s range)			
24	4.40	40x40	12s	11.75s	8,448
28	3.85	36x32	10s	9.50s	7,330
29½	3.33	34x34	10s	8.50s	6,680
30	2.90	40x32	9.50s	7.75s	6,264
30	3.00	48x48	12s	12s	8,640
30	4.00	36x32	12s	10.50s	8,160
30½	3.33	33x30	8s	9.75s	6,398
36	2.50	35x32	9.25s	7.75s	6,030
36	2.50	48x48	12s	12s	8,640

B	Y	E x P	W	F	BYT
		Osnaburgs (10s range) (Continued)			
36	2.75	35x32	9.25s	9.25s	6,633
36	2.85	32x28	9s	8s	6,156
36	2.85	40x40	11s	12s	8,208
36	2.95	32x26	9s	8s	6,160
36	3.00	32x28	9s	9s	6,480
36	3.25	32x28	10s	9.50s	7,020
36	3.50	32x28	11s	10s	7,560
36	3.50	32x34	12.50s	11s	8,316
36	3.50	34x32	14s	9s	8,316
36	3.60	32x28	12s	10s	7,776
36	3.60	32x29	12s	10s	7,906
36	3.60	33x28	12s	10s	7,906
36	3.75	32x28	12s	10.50s	8,100
36	3.90	32x28	12s	11.50s	8,424
36	3.90	33x28	12s	12s	8,564
36	4.05	28x24	11s	10s	7,582
36	4.05	32x26	12s	11s	8,456
37	2.90	36x32	10s	9.50s	7,296
39½	2.34	36x32	8s	8.50s	6,285
40	2.00	40x40	9s	9s	6,400
40	2.00	48x44	12.25s	8.75s	7,360
40	2.25	35x32	9.25s	7.75s	6,030
40	2.35	48x44	12.50s	11.50s	8,648
40	2.35	48x46	12.25s	12.25s	8,836
40	2.48	35x32	9.25s	9.25s	6,646
40	2.56	35x25	8.50s	8.50s	6,144
40	3.00	36x36	12s	12s	8,640
40	3.25	32x28	12s	10s	7,800
40	3.28	24x34	12s	10s	7,610
40	3.50	32x28	12s	11.50s	8,400
40	3.55	32x28	12.50s	10.50s	8,520
40	3.65	28x24	11s	10s	7,592
40	3.65	32x26	12s	11s	8,468
48½	1.90	32x40	8.50s	10s	6,635
56	2.50	32x28	12s	11s	8,400
60	2.33	32x28	12s	11s	8,388
76	1.26	36x36	9.50s	9.50s	6,895
		Coarse Sheetings (14s range)			
23	5.45	44x40	14s	14s	10,529
24	5.50	40x38	12s	16s	10,296
26	4.35	48x48	13.50s	16s	10,858
26½	5.00	40x38	12s	16s	10,335

B	Y	E x P	W	F	BYT
		Coarse Sheetings (14s range) (Continued)			
27	4.00	48x48	13s	15s	10,368
27	4.59	42x42	13s	15s	10,410
27	4.62	46x44	14s	16s	11,227
27	4.70	44x42	13.50s	16.50s	10,913
27	4.71	40x40	13.50s	13.50s	10,174
27	4.73	40x40	12.75s	14.60s	10,217
27	5.10	40x40	15s	15s	11,016
27½	4.50	44x40	14.28s	13.50s	10,395
28	4.00	48x48	12s	17.30s	10,752
28	4.50	40x38	13s	13s	9,828
28	4.55	40x40	12s	14.90s	10,192
30	3.41	48x48	13s	13.50s	9,821
30	3.50	48x44	14s	12.50s	9,660
30	3.60	48x46	13s	14s	10,152
30	3.60	48x48	14s	13.50s	10,368
30	3.61	48x44	14s	13s	9,964
30	3.75	48x44	13.60s	14.25s	10,350
30	3.75	48x48	12s	17.30s	10,800
30	3.85	48x40	12.75s	15s	10,164
30	4.00	48x44	15s	15s	11,040
30	4.05	48x42	14s	15.50s	10,935
30	4.25	46x46	16s	16s	11,730
30	4.25	48x42	14s	17.50s	11,475
30	4.31	40x40	12.75s	14.60s	10,344
30½	3.25	48x48	13s	13s	9,516
30½	4.00	48x48	15s	16.10s	11,712
31	3.50	48x44	14s	13s	9,982
31	3.55	48x44	12.50s	15s	10,125
31	3.65	48x46	13s	16s	10,636
31	3.90	44x44	13s	16s	10,639
31	4.20	48x44	17s	14.50s	11,978
31½	3.59	48x48	14s	15.50s	10,856
32½	3.80	48x48	16.25s	16.25s	11,856
33	3.40	48x48	13s	16s	10,771
34	3.80	40x36	13s	13s	9,819
35	3.38	48x42	14s	14.50s	10,647
35	3.40	48x46	14s	15.50s	11,186
35½	3.00	48x48	13s	14s	10,224
36	2.72	48x52	12.25s	14s	9,792
36	2.80	48x48	13s	13s	9,677
36	2.85	44x48	12.50s	12.50s	9,439
36	2.85	48x48	12.25s	14s	9,850
”	”	”	13s	13s	9,850

B	Y	E x P	W	F	BYT
		Coarse Sheetings (14s range) (Continued)			
36	2.85	48x48	13s	13.50s	9,850
”	”	”	13.65s	12.50s	9,850
”	”	”	14s	12s	9,850
36	2.95	56x56	15s	16s	11,470
36	2.98	44x40	12.25s	12.25s	9,012
36	2.98	44x44	12.75s	12.75s	9,441
36	2.99	48x48	13s	15s	10,333
36	3.00	48x44	13s	14.50s	9,936
36	3.00	48x46	13s	14s	10,152
36	3.00	48x48	12s	16.60s	10,368
”	”	”	12.25s	15s	10,368
”	”	”	12.50s	14.50s	10,368
”	”	”	13s	14s	10,368
”	”	”	13s	15s	10,368
”	”	”	13.50s	15s	10,368
”	”	”	13.65s	13.80s	10,368
”	”	”	14s	14s	10,368
36	3.00	48x52	13s	16s	10,800
36	3.05	52x54	15s	16.50s	11,639
36	3.08	48x40	12.50s	13.50s	9,757
36	3.08	48x46	13.50s	14.50s	10,423
36	3.10	48x48	14s	14s	10,714
36	3.11	44x42	13s	13s	9,629
36	3.22	40x40	12.75s	11.75s	9,274
36	3.22	48x40	12.75s	15s	10,201
36	3.25	40x40	12s	12.90s	9,360
36	3.25	44x42	14s	13s	10,062
36	3.25	48x40	13s	14s	10,296
”	”	”	13.50s	14.50s	10,296
36	3.25	48x44	13s	16s	10,764
”	”	”	13.65s	15s	10,764
36	3.25	48x48	13.70s	16.10s	11,232
36	3.27	48x36	12.50s	13.50s	9,888
36	3.28	40x40	13s	13s	9,446
36	3.30	44x44	13s	15s	10,454
36	3.30	48x48	15s	16s	11,405
36	3.40	48x50	14.50s	17.50s	11,995
36	3.45	48x44	14s	17s	11,426
36	3.50	40x38	13s	13s	9,828
”	”	”	13.65s	12s	9,828
36	3.50	40x40	14s	13s	10,080
36	3.50	44x40	12.50s	16s	10,584
36	3.51	40x40	12.75s	14.60s	10,109

B	Y	E x P	W	F	BYT
		Coarse Sheetings (14s range) (Continued)			
36	3.60	48x40	14s	16s	11,405
36	3.75	40x38	13s	15s	10,530
36	3.75	40x40	12.50s	16s	10,800
36	3.75	48x36	17s	13s	11,340
36	3.90	40x30	14s	12s	9,828
36	3.90	40x38	13s	16s	10,951
36	5.50	28x26	15s	13s	10,692
36	5.50	32x28	17s	14s	11,880
36½	3.50	40x40	12.50s	15s	10,220
36½	3.50	44x40	13.50s	16s	10,731
37	3.25	48x44	14s	16s	11,063
37	3.50	40x40	14s	14s	10,360
37	3.50	44x40	13.50s	16.50s	10,878
”	”	”	18s	12.25s	10,878
37	3.80	30x48	13s	15s	10,967
37	3.90	40x36	14s	16s	10,967
37	3.95	34x34	13s	13s	9,938
37½	3.50	40x40	13s	15s	10,500
37½	3.50	44x40	14s	16s	11,025
38	3.30	44x44	14s	16s	11,035
39	2.60	48x48	13s	13.50s	9,734
40	2.35	48x48	12.25s	12.25s	9,024
40	2.44	60x56	14s	16.50s	11,322
40	2.50	48x44	13s	12.50s	9,200
40	2.50	48x46	11.50s	13.50s	9,400
40	2.50	48x48	13s	13s	9,600
40	2.55	44x48	12.50s	13s	9,384
40	2.55	48x48	13s	13.50s	9,792
40	2.60	48x44	14s	12s	9,568
40	2.66	44x44	12.50s	13s	9,363
40	2.66	48x48	13.50s	13.50s	10,214
40	2.70	44x40	12.25s	12.25s	9,072
40	2.70	44x44	13s	13s	9,504
40	2.70	48x46	13s	14s	10,152
40	2.70	48x48	14s	14s	10,368
40	2.85	48x44	13s	14.50s	10,488
40	2.85	48x46	13.50s	15s	10,716
40	2.85	48x48	13.65s	16s	10,944
”	”	”	14s	15s	10,944
”	”	”	14s	16s	10,944
”	”	”	15s	14s	10,944
”	”	”	17s	13s	10,944
40	3.00	42x38	13s	13s	9,600

B	Y	E x P	W	F	BYT
		Coarse Sheetings (14s range) (Continued)			
40	3.00	48x44	15s	15s	11,040
40	3.00	48x48	14.50s	16s	11,520
40	3.25	48x40	14.50s	16s	11,440
40	3.25	48x44	17s	14.50s	11,960
44	2.50	44x48	26s	9s	10,120
44	2.85	44x44	14s	16s	11,035
45	2.40	48x48	13s	15s	10,368
48	2.15	48x48	12.50s	14s	9,907
48	2.25	48x48	13s	15s	10,368
48	2.38	48x48	15s	14s	10,967
50	1.70	60x48	16s	9.90s	9,180
52	2.24	40x44	14s	12.50s	9,784
54	2.00	44x44	12.50s	13s	9,504
54	2.00	48x46	14s	13.50s	10,152
54	2.00	48x48	13s	15s	10,368
63	1.59	48x52	14s	13s	10,017
69	1.45	48x52	14s	13s	10,005
		Coarse Sheetings (18s range)			
22½	7.50	44x40	19s	19s	14,175
26	5.20	48x44	15s	19s	12,438
26	5.95	48x48	19s	21s	14,851
26	6.21	48x44	18s	20.75s	14,854
26	6.25	44x44	20.50s	17s	14,300
27	5.00	46x46	18s	15s	12,420
27	5.10	48x48	16.25s	18.25s	13,219
27	5.85	44x40	20s	16s	13,268
30	3.25	64x60	15s	18s	12,090
30	4.45	44x48	15s	19s	12,282
30	4.50	46x46	18s	15s	12,420
30	4.50	48x44	18s	15s	12,420
30	4.50	48x48	16.25s	18.25s	12,960
30	4.85	52x50	18s	22s	14,841
30	4.91	48x44	17s	19.50s	13,552
30	4.96	44x48	16s	20s	13,690
30	5.00	40x44	15.50s	18.50s	12,600
30	5.00	42x40	15s	19s	12,300
30	5.00	44x40	16s	18s	12,600
30	5.00	48x44	17.50s	20s	13,800
30	5.00	52x48	18.50s	22s	15,000
30	5.85	40x44	18s	21s	14,742
31	2.85	48x48	20s	20.73s	14,880
31	4.50	44x44	17s	16s	12,276

B	Y	E x P	W	F	BYT
		Coarse Sheetings (18s range) (Continued)			
31	4.70	44x44	17s	17s	12,822
31	4.99	46x46	18s	19.50s	14,231
31	5.00	46x46	21s	17.80s	14,260
31	5.00	48x44	21s	19s	14,260
”	”	”	22.50s	17s	14,260
31	5.00	48x48	19s	21s	14,880
”	”	”	20s	20s	14,880
32	3.89	60x60	20s	20s	14,938
33½	4.00	48x48	16.25s	18.25s	12,864
33½	4.80	46x46	22s	18s	14,794
33½	5.40	40x40	18.50s	19.50s	14,472
35½	4.00	48x48	17s	20s	13,632
36	3.00	60x60	17s	18s	12,960
36	3.20	65x64	18.50s	22s	14,861
36	3.60	48x46	15s	18s	12,182
36	3.60	48x48	17s	17s	12,442
36	3.75	48x44	18s	15s	12,420
36	3.85	52x48	18s	20s	13,860
36	4.00	44x42	16s	17s	12,384
36	4.00	44x44	15s	19s	12,672
36	4.00	46x46	16.25s	18.25s	13,248
36	4.00	48x44	17s	18.50s	13,248
36	4.00	48x48	17s	21s	13,824
”	”	”	17.50s	20s	13,824
”	”	”	18s	19s	13,824
”	”	”	18s	20s	13,824
36	4.00	48x52	17s	21s	14,400
36	4.00	50x46	18.50s	18.50s	13,824
36	4.00	52x48	18s	21s	14,400
”	”	”	18.25s	19.50s	14,400
”	”	”	19.50s	19s	14,400
36	4.00	52x50	19.50s	19.50s	14,688
36	4.11	48x44	20.50s	17s	13,612
36	4.15	48x52	18s	22s	14,940
36	4.17	42x40	15s	18s	12,310
36	4.20	52x46	18s	22s	14,818
36	4.25	48x44	18s	20s	14,076
36	3.50	44x36	17s	17s	12,960
36	4.50	44x42	19.50s	17s	13,932
36	4.50	44x44	18s	20s	14,256
36	4.50	48x44	20s	18s	14,904
36	4.87	44x38	18.50s	19.50s	14,376
36	5.00	38x38	16.25s	18.25s	13,680

B	Y	E x P	W	F	BYT
		Coarse Sheetings (18s range) (Continued)			
36½	4.00	48x48	17s	21s	14,016
36½	4.00	48x52	19s	21s	14,600
37	4.00	48x44	20.50s	17s	13,616
37	4.00	48x48	17s	21s	14,208
”	”	”	18s	20s	14,208
”	”	”	18s	21s	14,208
”	”	”	18.50s	19.50s	14,208
”	”	”	20.50s	17s	14,208
”	”	”	21s	17s	14,208
37	4.00	52x48	18s	22s	14,800
37	4.50	44x40	20s	18s	13,986
38	2.86	56x64	18s	26s	13,042
38	2.94	60x64	17s	20s	13,853
38	2.99	64x60	19s	19s	14,089
38	3.12	60x60	18s	20s	14,227
38	3.24	60x60	20s	20s	14,774
38	4.00	48x44	18s	20s	13,984
38	6.60	26x30	18s	18s	14,045
39	3.75	44x40	17s	16s	12,285
39½	2.40	64x64	16s	17s	12,134
39½	2.58	74x66	18s	20s	14,267
40	3.05	56x56	17s	19s	13,664
40	3.06	60x60	20s	20s	14,688
40	3.60	48x48	18s	19s	13,824
40	3.75	42x40	15s	18s	12,300
40	3.75	44x40	15s	19s	12,600
40	3.75	48x40	17s	18s	13,200
40	3.75	48x44	17s	21s	13,800
”	”	”	18s	19s	13,800
”	”	”	18.50s	18.50s	13,800
”	”	”	20.50s	16s	13,800
”	”	”	21s	16s	13,800
40	3.75	48x48	18s	21s	14,400
40	3.80	43x40	24.50s	12.50s	12,616
40	4.00	42x44	18s	19s	13,760
40	4.05	44x44	17s	21s	14,256
40	4.05	48x44	20s	20s	14,904
40	4.25	40x38	17s	18s	13,260
40	4.25	40x40	17s	19s	13,600
40	4.25	43x40	24.50s	15s	14,110
40	4.25	44x40	17s	21s	14,280
”	”	”	20s	18s	14,280
40	4.50	40x42	20s	20s	14,760

B	Y	E x P	W	F	BYT
		Coarse Sheetings (18s range) (Continued)			
40	6.00	28x24	16s	16s	12,480
40½	3.75	40x44	17s	18s	12,758
40½	4.25	42x44	20s	20s	14,803
41	3.44	56x48	18s	20s	14,668
42	2.96	60x60	20s	20s	14,918
43	2.94	60x56	20s	20s	14,665
43	3.02	50x46	16s	17s	12,467
43	3.24	56x48	18s	21s	14,489
43	3.48	48x40	18s	17s	13,168
46	2.28	64x64	17s	19s	13,425
46	3.22	48x44	17s	19.50s	13,627
47	2.20	72x72	20.50s	22s	14,890
47	2.98	56x48	18s	21s	14,566
48	2.16	64x64	17s	19s	13,271
48	2.31	64x68	18s	22s	14,636
48	2.65	48x48	17s	16s	12,211
48	2.70	48x48	17s	16s	12,442
48	3.28	48x44	18s	20s	14,484
50	2.47	60x60	20s	20s	14,820
51½	3.00	42½x40	25s	12.50s	12,746
57	2.13	60x60	18s	21s	14,569
58	1.90	64x68	18s	22s	14,546
59	2.50	42x44	17s	17s	12,685
64	1.87	60x60	18s	21s	14,362
69	1.51	64x64	17s	19s	13,336
72	1.45	68x74	20s	20s	14,825
76	1.58	60x60	18s	21s	14,410
78	1.42	64x68	18s	22s	14,620
78	1.50	62x64	18s	20s	14,712
79	1.33	64x64	17s	19s	13,449
86	1.27	64x68	18s	22s	14,417
90	1.05	66x76	18s	20s	13,419
96	1.12	64x68	18s	21s	14,193
108	1.01	64x68	18s	22s	14,399
126	.895	64x64	20s	20s	14,435

Sheetings (22s range)

B	Y	E x P	W	F	BYT
22	10.00	40x40	20s	28s	17,600
24	7.30	48x48	21s	25s	16,819
26	6.50	48x48	21s	22s	16,224
26	6.72	48x39	20s	20.75s	15,201
26	6.75	48x48	21s	25s	16,848

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
26	6.85	46x46	22.50s	21.50s	16,385
26	8.00	44x40	22.50s	27s	17,472
26	9.00	40x36	22s	25s	17,784
27	7.50	40x40	20s	23s	16,200
27	7.66	40x36	20s	21s	15,718
27½	6.65	46x46	22.50s	21.50s	16,824
27½	6.80	42x44	22s	21s	16,082
28	7.16	40x36	20s	20s	15,236
29	6.44	42x44	22s	21s	16,061
30	4.18	60x60	20s	20s	15,048
30	5.50	48x44	20s	20s	15,180
30	5.50	48x48	20s	22s	15,840
30½	6.46	42x44	22.50s	21.50s	16,945
32	4.50	56x58	22s	22s	16,416
32	4.50	56x60	21s	24.50s	16,704
32	6.25	40x40	20s	22s	16,000
32	6.25	44x40	21s	23s	16,800
32	6.40	40x40	20s	23s	16,384
33	6.25	40x40	22.50s	21.50s	16,500
33½	6.00	36x40	20s	20s	15,276
34	3.71	60x60	20s	20s	15,137
34	5.82	48x40	22s	24s	17,413
34	6.00	40x40	20s	23s	16,320
34	6.00	44x40	21s	24s	17,136
34	6.50	40x40	21s	25s	17,680
36	3.00	68x72	20.25s	21.75s	15,120
36	3.13	68x74	21s	23s	16,001
36	3.15	68x72	20s	24s	15,876
36	3.20	68x76	20s	25.50s	16,589
36	3.25	68x72	20s	25s	16,380
36	3.25	68x76	21s	25s	16,848
36	3.45	64x68	19s	25.50s	16,394
36	3.50	62x62	20s	22s	15,624
36	3.50	64x64	20.50s	23s	16,128
36	3.50	64x68	20s	25.50s	16,632
”	”	”	21s	24s	16,632
”	”	”	21s	25s	16,632
”	”	”	22s	22s	16,632
36	3.50	68x64	21s	24s	16,632
36	3.52	64x66	22s	22s	16,474
36	3.60	64x68	21s	25s	17,107
36	3.68	64x62	20.50s	24s	16,692
36	3.70	64x68	21.50s	26s	17,582

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
36	3.70	64x68	22s	25s	17,582
36	3.75	60x64	21s	24s	16,740
36	3.75	64x64	22s	24s	17,280
36	3.75	64x68	22s	27s	17,820
36	4.00	54x56	20.50s	22s	15,840
36	4.00	56x56	22.50s	22s	16,128
36	4.00	56x58	21s	22s	16,416
36	4.00	56x60	20s	24s	16,704
”	”	”	20s	25s	16,704
”	”	”	21s	23s	16,704
”	”	”	21s	24s	16,704
”	”	”	22s	22s	16,704
36	4.00	58x58	21s	24s	16,704
36	4.00	60x52	20s	24s	16,128
36	4.00	60x56	20s	26s	16,704
”	”	”	21.50s	23s	16,704
36	4.00	60x60	21s	26s	17,280
36	4.01	52x56	21.50s	20.85s	15,591
36	4.20	56x56	23s	23s	16,934
36	4.25	48x56	20s	23s	15,912
36	4.25	56x56	21s	25s	17,136
36	4.25	60x52	21s	25s	17,136
36	4.31	56x56	23s	23s	17,378
36	4.50	48x52	21s	22s	16,200
36	4.50	52x48	19.50s	23s	16,200
36	4.50	52x52	21s	23s	16,848
36	4.50	56x48	22s	23s	16,848
36	4.50	56x52	22s	25s	17,496
36	4.50	60x48	22s	25s	17,496
36	4.60	50x48	21s	22s	16,229
36	4.70	48x48	20s	23s	16,233
36	4.70	48x50	21.50s	22s	16,582
36	4.70	48x52	22s	22s	16,920
36	4.70	52x46	21s	23s	16,582
36	4.70	52x48	20s	26s	16,920
36	5.00	44x44	20s	22s	15,840
36	5.00	48x44	22s	22s	16,560
36	5.00	48x48	20.50s	25s	17,280
”	”	”	22s	23.50s	17,280
36	5.20	46x46	21s	24s	17,222
36	5.48	48x40	20s	28s	17,361
36	5.50	40x40	20s	21.50s	15,840
36	5.50	44x40	22.50s	21.50s	16,632

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
36	5.50	44x42	21s	24s	17,028
36	5.50	44x44	21s	26s	17,424
36	5.50	48x40	22s	24s	17,424
36	6.00	40x36	21s	22.40s	16,416
36	6.00	40x40	21s	24.30s	17,280
36	6.10	40x40	21s	25s	17,568
36	6.15	40x36	20.50s	23s	16,826
36	6.15	40x40	21s	25s	17,712
36	6.35	40x36	21s	25s	17,374
36	6.50	40x36	22s	25s	17,784
36	6.75	38x32	21s	23s	17,010
36	7.00	40x28	21s	24s	17,136
36	8.00	32x28	22.50s	23s	17,280
37	5.50	44x44	21s	26s	17,908
37	6.65	38x30	21s	22s	16,731
38	2.60	72x80	20s	21s	15,018
38	3.00	72x72	20s	25s	16,416
38	3.21	60x64	26.50s	17s	15,126
38	4.00	48x52	20s	21s	15,200
38	4.00	56x56	21s	25s	17,024
38	5.50	40x40	22.50s	21.50s	16,720
38½	3.75	60x56	21s	24s	16,748
38½	4.50	48x52	21s	25s	17,325
39	3.00	72x72	26s	20s	16,848
39	3.11	68x76	22s	27s	17,466
39	3.60	60x52	20.50s	26s	15,725
40	2.00	60x52	21.50s	28s	17,920
40	2.70	68x72	20.25s	21.75s	15,120
40	2.90	70x66	21s	22s	15,766
40	2.92	65x64	18.50s	22s	15,067
40	2.93	68x76	21s	25s	16,877
40	2.99	64x72	22s	22s	16,266
40	3.00	68x72	21s	24s	16,800
40	3.15	64x64	22.25s	21.75s	16,128
”	”	”	22.50s	23s	16,128
40	3.15	64x68	20s	25.50s	16,632
”	”	”	21s	23.50s	16,632
”	”	”	21s	24s	16,632
”	”	”	21s	25s	16,632
”	”	”	22s	23s	16,632
40	3.15	68x64	21s	24s	16,632
40	3.17	64x66	22s	22s	16,484
40	3.20	64x68	18.50s	26.50s	16,896

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
40	3.33	64x68	21.50s	25.90s	17,582
40	3.35	64x64	22s	24s	17,152
40	3.35	64x68	22s	25s	17,688
40	3.40	64x68	21s	28s	17,952
40	3.40	68x64	22s	27s	17,952
40	3.60	56x56	22.50s	23s	16,128
40	3.60	56x60	20s	25s	16,704
40	3.60	60x52	20s	24s	16,128
40	3.60	60x56	21.50s	23s	16,704
40	3.60	60x60	21.50s	25s	17,280
40	3.86	56x56	21s	25s	17,293
40	4.00	48x48	20s	21s	15,360
40	4.02	60x52	21s	29s	17,965
40	4.05	56x52	22s	25s	17,496
40	4.30	56x48	21s	27s	17,888
40	4.50	48x48	21s	25s	17,280
40	5.00	44x40	21s	24s	16,800
40	5.00	44x44	21s	26s	17,600
40	5.55	36x40	21s	24s	16,872
40½	2.85	68x72	21s	27s	16,170
40½	5.00	42x44	22s	25s	17,415
41	3.51	56x56	22.50s	23s	16,118
42	2.59	68x72	20.25s	21.75s	15,223
42	2.98	64x64	22.25s	21.75s	16,020
42	3.00	64x66	22s	22s	16,360
42	3.05	64x64	22s	25s	16,397
42	3.06	64x68	21s	25s	16,965
42	3.19	64x64	22s	24s	17,149
42	3.43	60x56	21s	24s	16,711
42	3.55	56x60	22s	25s	17,296
42	3.71	48x56	22s	22s	16,205
42	4.20	48x48	21s	25s	16,934
42	5.60	42x26	26.50s	17s	16,229
43	3.10	60x56	20s	21s	15,463
43	3.35	56x56	21s	23s	16,134
44	4.00	48x48	21s	23s	16,896
”	”	”	23s	21s	16,896
45	2.45	70x72	22s	22.75s	15,656
45	2.54	66x72	23s	21s	16,002
45	2.62	66x72	20.50s	24s	16,270
45	2.72	64x64	20.50s	23s	15,667
45	2.82	60x60	20s	20s	15,228
45	2.83	64x64	22s	22.56s	16,324

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
45	2.85	64x68	22s	25s	16,929
45	2.86	64x66	22s	22s	16,731
45	2.86	64x68	21s	25s	16,988
45	2.91	66x68	23s	25s	17,547
45	2.95	64x64	22s	24s	16,992
45	2.97	64x64	25s	22s	17,107
45	2.98	64x64	20s	26s	17,165
46	2.43	68x76	20.50s	20.50s	16,096
46	2.56	68x76	21s	25s	16,957
46	2.43	68x76	20.50s	24.50s	16,096
46	2.56	68x76	21s	25s	16,957
46	2.72	60x60	20s	20s	15,014
46	3.15	60x56	21s	24s	16,808
46½	2.35	68x76	22s	21.40s	15,729
47	2.61	64x66	21.50s	22s	15,972
47	3.06	56x58	21.50s	23.50s	16,390
48	2.35	68x74	21s	23s	16,018
48	2.62	64x66	22s	22s	16,349
48	2.68	64x68	21s	25s	16,980
48	2.70	64x68	22s	25s	17,107
48	2.71	64x64	21s	24s	16,650
48½	2.25	70x72	22s	22.75s	15,496
49	2.33	68x72	23s	21s	15,984
49	2.67	66x68	23s	25s	17,531
49½	2.36	68x76	21s	25s	16,822
50	2.24	68x72	20.25s	21.75s	15,680
50	3.42	48x52	22s	23s	17,100
50½	3.20	48x48	20s	21s	15,514
51½	4.25	40x40	22s	25s	17,510
52	3.25	48x48	21s	22s	16,224
54	2.02	68x72	20.25s	21.75s	15,271
54	2.03	68x76	22s	21.40s	15,754
54	2.04	70x72	22s	22.75s	15,643
54	2.07	68x76	20.50s	24.50s	16,096
54	2.11	68x72	23s	21s	15,952
54	2.17	68x76	21s	25s	16,874
54	2.20	66x72	20.50s	24s	16,394
54	2.29	64x64	20.50s	23s	15,828
54	2.34	64x64	22.25s	21.75s	16,174
54	2.37	64x64	22s	22.56s	16,375
54	2.38	64x68	21s	25s	16,965
54	2.43	66x68	23s	25s	17,583
54	2.45	64x64	22s	23s	16,934

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
56	2.47	64x64	22s	25s	17,705
58	2.22	64x68	21s	25s	16,996
59	1.93	68x72	23s	21s	15,942
59	2.22	66x68	23s	25s	17,551
60	1.83	70x72	22s	22.75s	15,592
60	2.10	64x68	21s	23.50s	16,632
60	2.13	64x64	22s	22.56s	16,358
60	2.23	64x64	22s	25s	17,126
61	3.00	48x48	22s	25s	17,568
61½	2.25	64x64	22s	27s	17,712
63	1.74	68x76	22s	21.40s	15,776
63	1.75	68x72	20.25s	21.75s	15,435
63	1.78	68x76	20.50s	24.50s	16,148
63	1.82	68x72	23s	21s	16,052
63	1.86	68x76	21s	25s	16,874
63	1.88	66x72	20.50s	24s	16,345
63	1.95	64x64	20.50s	23s	15,725
63	2.01	64x64	22.25s	21.75s	16,209
63	2.04	64x64	22s	22.56s	16,426
63	2.04	64x68	21s	25s	16,935
63	2.08	66x68	23s	25s	17,559
67	1.93	64x68	22s	25s	17,069
70	1.50	72x72	20.25s	22s	15,140
70	1.62	68x72	23s	21s	15,876
70	1.86	66x68	23s	25s	17,447
71	1.94	64x64	22s	26s	17,631
72	1.50	72x72	20s	22s	15,552
72	1.52	68x72	20.25s	21.75s	15,322
72	1.52	68x72	20.25s	21.75s	15,322
72	1.52	68x76	22s	21.40s	15,790
72	1.56	68x76	20.50s	24.50s	16,174
72	1.59	68x72	23s	21s	16,027
72	1.63	68x76	21s	25s	16,900
72	1.65	66x72	20.50s	24s	16,394
72	1.70	64x64	20.50s	23s	15,667
72	1.77	64x64	22.25s	21.75s	16,312
72	1.78	64x64	22s	22.56s	16,451
72	1.79	64x68	21s	25s	17,012
72	1.80	64x64	22s	22s	16,589
72	1.82	66x68	23s	25s	17,559
72	1.88	64x64	22s	25s	17,326
73	1.44	72x72	20.25s	22s	15,106
76	1.88	60x56	22s	22s	16,574

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
76	2.02	60x56	22s	27s	17,808
77	1.69	64x68	22s	25s	17,177
79	1.72	64x64	22s	25s	17,393
80	1.56	64x66	21.50s	22s	16,193
80	1.83	56x58	21.50s	23.25s	16,726
81	1.31	68x74	21s	22s	15,068
81	1.33	72x72	20s	22s	15,513
81	1.35	68x72	20.25s	21.75s	15,309
81	1.36	68x76	22s	21.40s	15,863
81	1.38	68x76	20.50s	24.50s	16,096
81	1.40	68x72	23s	21s	15,876
81	1.40	72x76	21s	24s	16,783
81	1.45	68x76	21s	25s	16,913
81	1.45	72x76	22s	25s	17,148
81	1.46	68x68	21s	23s	16,083
81	1.48	66x72	20.50s	24s	16,543
81	1.52	64x64	20.50s	23s	15,789
81	1.52	72x72	22s	27s	17,729
81	1.55	68x68	22s	24s	17,075
81	1.57	64x64	22.25s	21.75s	16,278
81	1.59	64x64	22s	22.56s	16,444
81	1.59	64x68	21s	25s	17,000
81	1.60	64x64	22s	22s	16,589
81	1.62	66x68	23s	25s	17,583
81	1.69	64x64	22s	25s	17,522
81	1.80	56x56	23s	21.50s	16,330
82	1.30	72x72	20.25s	22s	15,055
82	1.51	64x66	21.50s	22s	16,086
82	1.79	56x58	21.50s	23.50s	16,742
86	1.51	64x68	22s	25s	17,142
86	1.66	60x56	22s	22s	16,560
86	1.77	60x56	22s	25s	17,658
88	1.55	64x64	22s	25s	17,459
90	1.16	72x72	20.25s	22s	15,124
90	1.18	68x74	21s	22s	15,080
90	1.20	72x72	20s	22s	15,552
90	1.22	68x76	22s	21.40s	15,811
90	1.25	68x76	20.50s	24.50s	16,200
90	1.27	68x72	23s	21s	16,002
90	1.30	68x76	21s	25s	16,848
90	1.32	66x72	20.50s	24s	16,394
90	1.37	64x64	20.50s	23s	15,782
90	1.39	64x66	21.50s	22s	16,263

B	Y	E x P	W	F	BYT
		Sheetings (22s range) (Continued)			
90	1.43	64x64	22s	22.56s	16,451
90	1.43	64x68	21s	25s	16,988
90	1.45	66x68	23s	25s	17,487
90	1.52	64x64	22s	25s	17,510
90	1.62	56x58	21.50s	23.50s	16,642
94	1.50	56x56	23s	21.50s	15,792
96	1.34	64x68	21s	25s	16,980
98	1.39	64x64	22s	25s	17,436
99	1.11	68x76	22s	21.40s	15,824
99	1.12	68x72	20.25s	21.75s	15,523
99	1.14	68x76	20.50s	24.50s	16,252
99	1.24	64x64	20.50s	23s	15,713
99	1.29	64x64	22.25s	21.75s	16,347
99	1.30	64x64	22s	22.56s	16,474
99	1.30	64x68	21s	25s	16,988
99	1.32	66x68	23s	25s	17,511
99	1.36	64x64	22s	25s	17,234
99	1.45	56x56	23s	21.50s	16,078
99	1.50	56x56	24s	22s	16,632
100	1.47	56x58	21.50s	23.25s	16,792
108	1.02	68x72	20.25s	21.75s	15,422
108	1.02	68x76	22s	21.40s	15,832
108	1.04	68x76	20.50s	24.50s	16,174
108	1.14	64x64	20.50s	23s	15,759
108	1.18	64x64	22.25s	21.75s	16,312
108	1.19	64x64	22s	22.56s	16,451
108	1.25	56x56	20s	20s	15,120
108	1.26	64x64	22s	25s	17,418
118	1.00	64x64	20s	20s	15,104
156	.76	64x64	20s	20s	15,176
		Sheetings (26s range)			
27	6.70	52x48	22.50s	28s	18,090
27	9.25	40x40	26s	26s	19,980
28	8.40	44x40	25s	27s	19,757
28½	8.00	44x40	25s	25s	19,152
30	6.66	48x48	24s	26s	19,181
32	5.00	56x60	21s	29s	18,560
32	7.25	40x40	22s	27s	18,560
35½	4.50	58x56	24s	24s	18,211
36	4.00	68x72	25s	29s	20,160
36	5.00	56x48	21s	30s	18,720
36	5.35	48x48	20s	30s	18,490

B	Y	E x P	W	F	BYT
		Sheetings (26s range) (Continued)			
36	5.50	48x44	22s	27s	18,216
36	5.50	48x48	25s	25s	19,008
36	6.00	44x40	22s	27s	18,144
36	6.00	44x44	25s	25s	19,008
36	6.00	46x42	24s	26s	19,008
36	6.00	48x48	27s	27s	20,736
36	6.05	44x44	22s	28s	19,166
36	6.15	40x44	23s	26s	18,598
36	6.15	42x40	22s	26s	18,155
36	6.15	44x38	22s	26s	18,155
36	6.15	44x40	23s	26s	18,598
36	6.15	44x44	24s	27s	19,483
36	6.35	44x36	22s	27s	18,288
36	6.50	40x40	22s	27s	18,720
36	6.50	42x36	22s	25s	18,252
36	6.50	44x40	24s	26s	19,656
36	8.00	32x38	25s	27s	20,160
36½	5.50	48x48	24s	27s	19,272
37	6.33	40x40	22s	27s	18,737
37	6.50	40x36	22s	26s	18,278
37½	5.25	48x48	25s	25s	18,906
38	3.60	64x68	22s	25s	18,052
38½	4.25	56x56	21s	28s	18,326
39	3.80	64x64	25s	25s	18,970
39	4.00	64x68	28s	28s	20,592
40	3.45	68x64	22s	27s	18,216
40	3.60	56x56	22s	28s	18,432
40	3.60	68x72	25s	29s	20,160
40	3.90	56x60	24s	24s	18,096
40	3.90	60x56	21s	29s	18,096
40	4.00	64x64	25s	27s	20,480
40	4.50	52x48	22s	26s	18,000
40	4.75	48x56	25s	27s	19,760
40	5.50	44x40	22.50s	28s	18,480
40	5.50	44x44	24s	27s	19,360
40	6.50	40x36	32s	21.50s	19,760
41	2.90	74x86	22s	32s	19,024
41	2.85	76x84	22s	32s	18,696
43	3.98	60x50	22s	28s	18,825
43	5.80	36x40	22s	27s	18,954
44	5.00	44x40	24.50s	25s	18,480
45	3.20	64x68	25s	27s	19,008
46	4.35	48x44	22s	27s	18,409

B	Y	E x P	W	F	BYT
		Sheetings (26s range) (Continued)			
46	4.35	48x48	25s	27s	19,210
48	4.17	48x48	25s	27s	19,215
50½	4.10	44x36	22s	27s	18,634
50½	4.65	40x40	22s	27s	18,786
51	3.85	48x48	24s	25.50s	18,850
51½	3.85	48x48	24s	25s	19,034
”	”	”	24.50s	25s	19,034
”	”	”	24s	27s	19,034
51½	4.25	44x40	22s	27s	18,386
51½	4.25	44x44	23.75s	27s	19,261
51½	4.50	40x40	22s	27s	18,540
51½	4.50	44x40	25s	27s	19,467
51½	4.75	40x40	24s	27s	19,570
51½	4.75	44x40	25s	29s	20,548
52	3.85	48x48	23s	27s	19,219
”	”	”	25s	25s	19,219
”	”	”	25s	27s	19,219
52	4.00	44x46	22s	27s	18,720
52	4.50	40x40	22s	27s	18,720
52	4.50	44x40	25s	27s	19,656
56	3.03	60x52	25s	25s	19,004
57	3.47	48x48	25s	25s	18,988
58	4.05	40x40	22s	27s	18,792
58	4.25	44x40	24.50s	30s	20,706
60	2.75	60x56	24s	26s	19,140
60	3.25	48x48	22s	27s	18,720
60	3.30	48x48	25s	25s	19.008
60	3.65	44x44	24s	27s	19,272
60	3.80	44x48	24.50s	30s	20,976
60	3.90	40x40	22s	27s	18,720
60	4.18	40x40	25s	27s	20,064
63	3.15	48x48	25s	27s	19,051
67	2.95	48x48	25s	25s	18,977
69	2.87	48x48	25s	25s	19,019
72	2.75	48x48	25s	25s	19,008
76	2.25	60x60	22s	40s	20,520
81	1.64	60x64	25s	25s	18,481
81	1.66	72x72	25s	27s	19,362
81	1.85	60x68	25s	27s	19,181
81	1.95	64x60	25s	28s	19,586
87	1.95	60x60	22s	40s	20,358
87	1.97	60x60	20.50s	25.50s	20,567
87	2.00	60x60	26s	28s	20,880

B	Y	E x P	W	F	BYT
		Cheesecloths			
25	10.20	44x44	30s	30s	22,440
25	10.25	44x44	28s	32s	22,550
25	11.00	52x44	29s	44s	26,400
25	11.00	56x40	30s	40s	26,400
25	12.60	48x36	28s	42s	26,460
25	13.25	40x36	28s	38s	25,175
25	13.25	44x36	30s	40s	26,500
25	13.25	48x36	32s	42s	27,825
25	14.00	40x36	30s	40s	26,600
25	14.59	40x36	32s	40s	27,721
25	14.60	40x32	31.25s	40s	26,280
25	14.75	40x32	30s	40s	26,550
27	9.00	44x44	28s	30s	21,384
27	9.50	44x44	28s	32s	22,572
”	”	”	29.25s	30s	22,572
”	”	”	30s	31s	22,572
27	9.85	56x40	28.50s	38.50s	25,531
28	9.15	40x44	28s	30s	21,521
28	9.15	48x44	28s	37s	23,570
28	11.28	44x40	30s	40s	26,531
28	11.50	44x36	32s	40s	25,760
28	12.50	40x32	31.25s	40s	25;200
28	13.50	40x28	29s	37s	25,704
29	9.70	48x48	30s	42s	27,005
29	15.35	32x28	32s	40s	26,709
30	10.52	44x40	30s	40s	26,510
30	10.85	44x36	32s	40s	26,040
31½	8.45	56x40	28.50s	38.50s	25,553
31½	8.60	48x48	30s	40s	26,006
31½	8.70	48x48	28s	42s	26,309
31½	8.85	48x44	32s	40s	25,647
32	8.50	48x48	30s	40s	26,112
32	8.80	48x48	28s	42s	27,034
32	9.87	44x40	30s	40s	26,531
32	12.60	36x32	30s	42s	27,418
32	13.50	32x28	30s	37s	25,920
32	14.50	34x22	28s	42s	25,984
33	9.90	44x36	31s	42s	26,136
34	9.40	44x40	30s	40s	26,846
34½	8.00	48x48	29s	40s	26,496
35	29.10	18x14	39s	42s	32,592
35	30.10	17x14	39s	42s	32,658
36	7.65	48x48	30s	40s	26,438

B	Y	E x P	W	F	BYT
		Cheesecloths (Continued)			
36	7.75	48x44	29s	38s	25,668
36	8.10	44x44	29s	38s	25,661
36	8.10	48x40	29s	38s	25,661
36	8.40	44x44	30s	39s	26,611
36	8.50	40x40	28s	36s	24,480
36	8.50	44x40	30s	37s	25,704
36	8.77	44x40	30s	40s	26,520
36	9.11	40x40	30s	40s	26,237
36	9.20	40x40	29s	40s	26,496
36	9.20	44x36	31s	40s	26,496
36	9.65	40x32	28s	37s	25,013
36	9.65	40x36	28s	40s	26,402
36	9.79	40x36	30s	40s	26,784
36	10.20	40x32	30s	38s	26,438
36	10.50	36x32	30s	37s	25,704
36	10.80	36x32	30s	38s	26,438
36	10.86	36x32	31.25s	40s	26,585
36	11.20	36x32	30s	42s	27,418
36	11.30	32x28	28s	35s	24,408
36	11.50	32x28	28s	36s	24,840
36	11.50	36x32	30s	43s	28,152
36	11.90	32x28	30s	41s	25,704
36	12.00	32x28	30s	37s	25,920
36	12.25	32x28	30s	38s	26,460
36	12.42	32x28	30s	40s	26,827
36	12.50	32x28	31s	43s	27,000
36	12.61	32x28	31.25s	40s	27,238
36	12.85	32x28	30s	43s	27,756
36	13.00	32x28	31s	43s	28,080
36	13.50	32x24	30s	42s	27,216
36	13.60	28x24	30s	41s	25,549
36	14.00	28x24	30s	37s	26,208
36	14.25	28x24	30s	38s	26,676
36	14.35	28x24	31s	43s	26,863
36	14.53	28x24	30s	40s	27,200
36	14.85	28x24	30s	41s	27,799
36	15.00	28x22	30s	40s	27,000
36	15.00	28x24	30s	43s	28,080
”	”	”	31s	43s	28,080
”	”	”	32s	44s	28,080
36	15.80	26x22	30s	40s	27,302
36	16.00	24x20	28s	36s	25,344
36	16.49	24x20	31.25s	40s	26,136

B	Y	E x P	W	F	BYT
		Cheesecloths (Continued)			
36	16.85	24x20	30s	38s	26,690
36	17.00	24x20	29s	43s	26,928
”	”	”	30s	41s	26,928
”	”	”	30s	42s	26,928
”	”	”	31s	40s	26,928
36	17.20	22x18	30s	41s	27,360
36	17.30	24x20	30s	40s	27,403
36	17.60	22x18	30s	36s	25,344
36	18.00	22x18	30s	37s	25,920
36	18.88	22x18	30s	40s	27,187
36	19.00	22x18	29s	43.75s	27,360
”	”	”	31s	43s	27,360
36	20.00	20x16	30s	37s	25,920
36	20.21	30x16	30s	40s	26,192
36	21.00	20x14	30s	37s	25,704
36	21.00	20x16	29s	42s	27,216
”	”	”	30s	41s	27,216
36	22.00	20x14	30s	40s	26,928
36	22.31	20x12	31.25s	40s	25,701
36	23.00	20x12	30s	39s	26,496
”	”	”	30s	40s	26,496
”	”	”	30s	41s	26,496
”	”	”	30s	45s	26,496
”	”	”	30s	46s	26,496
”	”	”	31s	40s	26,496
36	23.25	20x12	30s	40s	26,784
36	23.50	20x12	29s	43s	27,072
36	25.00	20x10	30s	42s	27,000
36	38.30	14x10	39s	42s	33,091
36½	30.00	16x8	30s	38s	26,280
36½	40.00	8x8	28s	29s	23,360
37	9.38	40x36	30s	40s	26,377
38	7.15	48x48	29s	38s	26,083
38½	7.01	48x48	30s	40s	25,909
38½	7.15	48x48	30s	40s	26,426
38½	7.24	44x40	31.70s	34s	23,414
38½	7.30	52x40	29s	40s	25,857
38½	7.46	48x44	30s	42s	26,423
38½	7.65	44x44	30s	40s	25,918
38½	7.65	48x40	30s	40s	25,918
38½	8.00	44x40	30s	40s	25,872
38½	8.10	44x40	30s	40s	26,195
38½	8.15	44x40	28s	44s	26,357

B	Y	E x P	W	F	BYT
		Cheesecloths (Continued)			
38½	8.17	44x40	30s	40s	26,422
38½	8.20	40x40	28s	40s	25,256
38½	8.20	44x40	28s	42s	26,519
”	”	”	28s	44s	26,519
”	”	”	29s	39s	26,519
”	”	”	29s	40s	26,519
”	”	”	29s	42.50s	26,519
”	”	”	29.50s	41s	26,519
”	”	”	30s	40s	26,519
”	”	”	30s	41s	26,519
”	”	”	30s	43s	26,519
”	”	”	30s	44s	26,519
”	”	”	30.50s	42s	26,519
”	”	”	31s	38.50s	26,519
”	”	”	31s	41s	26,519
”	”	”	31s	44.50s	26,519
38½	8.50	44x36	29s	40s	26,180
38½	8.60	44x36	30s	43s	26,488
”	”	”	30s	45s	26,488
”	”	”	30.50s	42s	26,488
”	”	”	31s	39s	26,488
”	”	”	31s	40s	26,488
”	”	”	31s	41s	26,488
”	”	”	31s	42s	26,488
”	”	”	31s	44.50s	26,488
”	”	”	31.50s	41s	26,488
”	”	”	31.71s	42s	26,488
38½	9.80	40x32	30s	43s	27,166
38½	9.80	44x24	31.71s	42s	25,656
38½	12.00	32x28	30s	43s	27,720
39	8.00	44x40	28s	44s	26,208
39	9.20	40x32	30s	38s	25,834
39	9.80	40x28	30s	38s	25,990
39	11.84	32x28	30s	43s	27,706
39	21.00	20x12	31s	40s	26,208
39	21.23	20x12	30s	41s	26,495
39	22.16	18x14	29s	43s	27,656
40	34.70	14x10	39s	42s	33,312
40	7.00	48x48	30s	40s	26,880
40	7.25	52x40	28s	44s	26,680
40	7.50	48x40	31s	42s	26,400
40	7.90	44x40	30s	40s	26,544
40	8.25	44x36	31s	39s	26,400

B	Y	E x P	W	F	BYT
		Cheesecloths (Continued)			
40	8.25	44x36	31s	40s	26,400
40	8.28	44x36	31.25s	40s	26,496
40	9.10	40x32	30s	40s	26,208
40	10.80	32x28	30s	38s	25,920
40	11.70	32x28	30s	43s	28,080
40	12.30	28x24	31.25s	40s	25,584
40	13.50	28x24	31s	43s	28,080
40	15.40	24x20	30s	40s	27,104
41	7.20	48x40	31s	42s	25,978
41	7.25	52x40	29s	45s	27,347
41	7.70	44x40	31s	42s	26,519
41	8.10	44x36	31s	42s	26,568
42	6.70	48x48	30s	42s	27,014
42	7.50	44x40	30s	40s	26,460
42	10.50	32x28	30s	40s	26,460
42	19.75	18x16	30s	40s	25,704
42½	20.30	18x14	30s	47s	27,608
43	8.25	40x32	28s	38s	25,542
44	6.36	48x48	30s	40s	26,865
44	6.40	48x44	31s	41s	25,907
44	6.40	48x48	28s	42s	27,034
”	”	”	30s	40s	27,034
44	7.25	40x44	29s	42s	26,796
44	7.25	44x40	29s	42s	26,796
44	7.60	44x36	30s	40s	26,752
44	8.50	36x32	28s	38s	25,432
45	7.35	44x36	30.50s	46s	26,460
46	6.15	40x38	30s	28s	22,066
48	5.90	40x38	30s	29s	22,090
48	18.00	16x16	30s	40s	27,648
50	5.60	44x40	30s	33s	23,520
50	17.50	18x16	29s	43s	29,750
51½	5.00	44x40	24.50s	30s	21,630
54	5.25	40x38	30s	28s	22,113
55	4.87	44x40	30s	28s	22,499
56	12.50	22x18	32s	40s	28,000
60	4.46	44x40	30s	28s	22,478
		Printcloths			
21	9.10	72x60	30s	40s	25,225
21	9.65	68x56	31.25s	40s	25,129
23	8.92	64x60	30s	38s	25,440
23	10.25	56x54	30s	40s	25,932

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
24	8.45	64x56	31.25s	40s	25,147
24	10.77	56x44	29s	42s	25,848
25	7.60	64x60	28s	36s	23,560
25	8.21	64x60	30s	38s	25,541
25	10.55	56x44	30s	40s	26,375
25	10.59	56x44	28s	42s	26,475
25	11.00	58x45	32s	44s	28,325
26	7.06	64x72	30s	38s	24,964
26	9.67	56x48	28s	41s	26,148
26	10.00	56x44	30s	40s	26,000
27	6.00	72x76	28.50s	37s	23,976
27	6.25	72x76	30s	38s	24,975
27	7.46	64x60	30s	38s	24,976
27	7.60	64x60	28s	38s	25,445
”	”	”	28s	40s	25,445
”	”	”	28.50s	37s	25,445
”	”	”	29s	38s	25,445
”	”	”	29.25s	40.25s	25,445
”	”	”	29.50s	39s	25,445
”	”	”	30s	38s	25,445
”	”	”	30s	40s	25,445
”	”	”	30s	43s	25,445
27	7.70	64x56	30s	40s	24,948
27	7.80	64x56	30.50s	41s	25,272
27	7.85	64x56	30s	40s	25,434
27	7.90	64x56	31s	41s	25,596
27	8.14	56x60	28s	40s	25,494
27	8.25	56x60	28s	41s	25,839
27	8.70	56x56	30s	42s	26,309
27	8.70	56x51	31s	44.50s	25,134
27	8.77	56x52	30s	38s	25,573
27	8.78	56x56	28s	44s	26,551
27	8.85	56x52	30.50s	44s	25,807
27	9.00	56x52	30s	40s	26,244
27	9.40	56x44	28.50s	38.50s	25,380
27	9.50	56x44	29s	40s	25,650
27	9.75	56x44	29s	41s	26,325
27½	7.46	64x60	29s	39s	25,439
28	6.25	64x76	28s	38s	24,500
28	6.45	64x72	32s	32s	24,562
28	7.00	60x52	28s	28s	21,952
28	7.00	64x64	28s	37s	25,088
”	”	”	28s	40s	25,088

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
28	7.00	64x64	28.50s	38.50s	25,088
”	”	”	30s	36s	25,088
”	”	”	30s	38s	25,088
28	7.13	64x64	30s	39s	25,554
28	7.30	64x60	30s	38s	25,346
”	”	”	30s	40s	25,346
28	7.35	64x56	30s	36s	24,696
28	7.35	64x60	30s	40s	25,519
28	7.50	64x56	30s	38s	25,200
28	8.00	56x60	28s	41s	25,984
28	8.70	56x60	32s	43s	28,258
28	9.00	56x52	30s	42s	27,216
29	5.36	72x76	28s	35s	23,005
29	7.50	64x72	36s	42s	29,580
30	5.50	68x68	28s	32s	22,440
30	6.85	64x60	30s	39s	25,482
30	6.94	64x60	29.50s	42s	25,817
30	8.00	60x48	30s	48s	25,920
30½	5.26	72x80	30s	37s	24,385
30½	6.52	72x48	28s	36s	23,863
31½	7.50	56x52	29s	39s	25,515
31½	7.60	56x52	28s	42s	25,855
32	5.75	64x60	28s	33s	22,816
32	6.12	64x64	30s	38s	25,068
32	6.20	64x60	30s	36s	24,602
32	6.50	64x60	31s	40s	25,792
32	6.65	64x56	31s	42s	25,536
”	”	”	31s	43.50s	25,536
”	”	”	31s	44.50s	25,536
”	”	”	32s	40s	25,536
32	6.74	66x54	30s	40s	25,882
32	7.60	60x48	32s	40s	26,266
33½	7.19	56x56	30s	42s	26,977
34	5.00	67x72	28s	36s	23,630
34	5.50	80x80	36s	42s	29,920
34	5.75	64x60	28s	38s	24,242
34	5.75	64x64	28s	40s	25,024
34	6.00	64x60	28s	40s	25,296
34	6.15	56x56	30s	32s	23,419
34	6.30	56x44	30s	28s	21,420
34	6.40	64x72	36s	42s	29,594
34	6.95	64x52	30s	44s	27,411
34½	4.63	72x80	28s	38s	24,280

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
34½	5.37	72x68	30s	40s	25,937
34½	6.08	75x44	30s	40s	24,961
34½	7.25	56x52	31s	42s	27,014
34½	7.60	56x44	31s	44.50s	26,220
34½	7.65	56x44	30s	40s	26,393
35	4.98	68x72	33s	33s	24,402
35	5.00	68x72	30s	37s	24,500
35	6.70	56x44	29s	32s	23,450
35½	7.00	55x51	29s	38s	26,341
36	3.94	76x80	28s	32s	22,127
36	4.59	72x80	30s	39s	25,116
36	4.87	60x60	28s	28s	21,038
36	5.00	64x64	29s	31s	23,040
”	”	”	30s	30s	23,040
”	”	”	30s	32.50s	23,040
36	5.15	68x72	30s	40s	25,956
36	5.50	64x56	28s	36s	23,760
36	5.50	64x64	30s	38s	25,344
36	5.75	64x56	30s	37s	24,840
36	5.75	64x60	30s	38s	25,668
36	5.82	60x60	30s	38s	25,142
36	5.90	64x56	30.50s	42.25s	25,488
”	”	”	31s	42s	25,488
36	6.00	56x56	28s	36s	24,192
36	6.43	60x52	28s	40s	25,926
36	6.70	60x48	31s	43s	26,050
36	7.00	52x52	28s	40s	26,208
36½	4.00	80x86	30s	36s	24,236
36½	4.00	88x88	30.50s	41s	25,696
36½	4.70	72x80	30s	41s	26,076
36½	5.75	64x60	30.50s	41s	26,024
37	5.56	64x60	30s	42.50s	25,509
37½	4.70	64x68	28s	35s	23,265
37½	6.40	60x48	32s	42s	25,920
38	5.10	64x64	28s	40s	24,806
38	5.20	64x56	28s	36s	23,712
38	6.80	56x44	28s	42s	25,840
38½	4.00	80x80	30s	39s	24,640
38½	4.30	80x72	31s	41.50s	25,164
38½	4.37	72x80	31s	40s	25,573
38½	4.70	80x80	36s	42s	28,952
38½	4.75	68x72	30s	40s	25,603
38½	5.00	75x58	31s	47.50s	25,602

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
38½	5.15	64x60	30s	37s	24,586
38½	5.15	64x64	30s	38s	25,379
38½	5.17	64x60	30s	36s	24,682
38½	5.24	64x60	31.25s	40s	25,016
38½	5.26	64x64	30s	40s	25,921
38½	5.30	64x60	30s	39s	25,302
38½	5.35	64x56	31s	38s	24,717
38½	5.35	64x60	28s	40s	25,541
”	”	”	28s	41s	25,541
”	”	”	28s	42s	25,541
”	”	”	28s	44s	25,541
”	”	”	28.50s	38.50s	25,541
”	”	”	28.50s	39s	25,541
”	”	”	28.50s	40.50s	25,541
”	”	”	29s	37.50s	25,541
”	”	”	29s	38s	25,541
”	”	”	29s	39s	25,541
”	”	”	29s	40s	25,541
”	”	”	29s	42s	25,541
”	”	”	29.25s	40.25s	25,541
”	”	”	29.50s	39s	25,541
”	”	”	30s	38s	25,541
”	”	”	30s	39s	25,541
”	”	”	30s	40s	25,541
”	”	”	30s	41s	25,541
”	”	”	30s	42s	25,541
”	”	”	30.50s	42s	25,541
”	”	”	30.70s	40s	25,541
”	”	”	31s	40s	25,541
”	”	”	31s	41s	25,541
”	”	”	31s	42s	25,541
”	”	”	32s	40s	25,541
”	”	”	33s	36s	25,541
38½	5.43	75x44	30s	40s	24,878
38½	5.50	64x52	30s	36s	24,563
38½	5.50	64x56	30s	40s	25,410
”	”	”	30s	42s	25,410
”	”	”	30s	42.50s	25,410
”	”	”	30.50s	39.30s	25,410
”	”	”	30.50s	39.50s	25,410
”	”	”	30.50s	41s	25,410
”	”	”	30.50s	42.90s	25,410
”	”	”	31s	38s	25,410

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
38½	5.50	64x56	31s	40s	25,410
”	”	”	31s	41.50s	25,410
”	”	”	31s	42s	25,410
”	”	”	31s	43s	25,410
”	”	”	31.70s	42s	25,410
38½	5.50	64x64	30s	42s	27,104
38½	5.75	64x52	30s	40s	25,679
38½	6.00	60x48	28.50s	38.50s	24,948
38½	6.00	60x52	30s	40s	25,872
38½	6.00	60x56	30s	42s	26,796
38½	6.13	60x48	31.25s	45s	25,488
38½	6.15	60x48	30s	40s	25,572
38½	6.20	60x48	28s	42s	25,780
38½	6.25	56x52	31s	41s	25,987
38½	6.25	60x48	30s	40s	25,987
”	”	”	30s	42s	25,987
”	”	”	30s	43s	25,987
”	”	”	31s	41s	25,987
”	”	”	31s	43.50s	25,987
”	”	”	31.50s	43s	25,987
”	”	”	31.70s	42s	25,987
38½	6.35	60x48	29.50s	44s	26,403
38½	6.40	56x52	31s	44.50s	26,611
38½	6.50	56x52	31s	44.50s	27,027
38½	6.85	56x44	30s	40s	26,372
”	”	”	31s	44s	26,372
”	”	”	31.15s	40s	26,372
39	3.01	88x92	28s	32s	21,130
39	3.25	88x92	30.50s	30.50s	22,815
39	3.40	80x92	28s	35s	22,807
39	3.45	80x88	28s	35s	22,604
39	3.50	80x84	28s	33s	22,386
39	3.50	80x92	28s	36s	23,478
39	3.65	80x92	30.50s	35.50s	24,484
39	3.90	76x84	28s	38s	24,336
39	3.90	80x84	30s	40s	24,944
39	3.90	80x92	30s	44s	26,161
39	3.92	80x80	31.25s	40s	24,461
39	4.00	68x76	30.50s	29s	22,464
39	4.00	80x80	28s	39s	24,960
”	”	”	28.50s	39.50s	24,960
”	”	”	29s	39s	24,960
”	”	”	29.25s	40.25s	24,960

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
39	4.00	80x80	30s	38s	24,960
”	”	”	30s	40s	24,960
”	”	”	30s	41s	24,960
”	”	”	30s	41.50s	24,960
”	”	”	30s	42s	24,960
”	”	”	30.50s	39.50s	24,960
”	”	”	30.50s	39.87s	24,960
”	”	”	30.50s	41s	24,960
”	”	”	30.50s	43s	24,960
”	”	”	31s	37s	24,960
”	”	”	31s	38s	24,960
”	”	”	31s	40s	24,960
”	”	”	31s	41s	24,960
”	”	”	31s	42s	24,960
”	”	”	31s	43s	24,960
”	”	”	31.50s	43s	24,960
”	”	”	33s	36s	24,960
39	4.00	80x92	30.50s	42s	26,832
39	4.10	72x80	28s	38s	24,305
39	4.10	80x80	29.50s	41s	25,584
39	4.25	68x76	29s	36s	23,868
”	”	”	30.50s	33s	23,868
39	4.25	72x76	30s	37s	24,531
”	”	”	30s	38s	24,531
”	”	”	30s	38.50s	24,531
”	”	”	30s	40s	24,531
”	”	”	30s	41s	24,531
39	4.30	72x76	29s	38s	24,820
39	4.30	72x80	31s	40s	25,490
39	4.35	72x76	28.50s	39s	25,108
39	4.50	64x68	30s	44s	26,676
39	4.50	68x76	29s	40s	25,272
39	4.50	68x80	30s	40s	25,974
39	4.50	72x68	30s	42s	24,570
39	4.50	72x80	30s	42s	26,676
39	4.59	68x72	30s	40s	25,061
39	4.66	68x72	30s	41s	25,444
39	4.68	68x72	28.50s	43.50s	25,553
39	4.70	68x72	30s	40s	25,662
39	4.75	68x72	29s	39s	25,935
”	”	”	29.50s	41.50s	25,935
”	”	”	30s	39s	25,935
”	”	”	30s	40s	25,935

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
39	4.75	68x72	30s	41s	25,935
”	”	”	30s	42s	25,935
”	”	”	30s	42.50s	25,935
”	”	”	30s	43s	25,935
”	”	”	31s	40s	25,935
”	”	”	31.50s	43s	25,935
”	”	”	32s	40s	25,935
”	”	”	33s	36s	25,935
39	4.80	64x72	30s	39s	25,459
39	4.84	68x72	28s	44s	26,426
39	4.85	68x64	29s	40s	24,968
”	”	”	30s	40s	24,968
”	”	”	30s	42.50s	24,968
”	”	”	30s	45s	24,968
”	”	”	30.10s	40.10s	24,968
”	”	”	30.50s	38.90s	24,968
”	”	”	30.50s	39.50s	24,968
”	”	”	31s	38s	24,968
”	”	”	31s	40s	24,968
”	”	”	31s	42s	24,968
”	”	”	31.50s	41s	24,968
39	4.85	68x72	29.50s	41s	26,481
39	4.96	68x68	30s	42s	26,308
39	4.97	68x68	30s	40s	26,361
39	4.99	68x60	28s	44s	24,910
39	5.00	64x64	28s	42s	24,960
39	5.10	64x64	30s	38s	25,459
39	5.15	64x64	30s	40s	25,709
39	5.25	64x56	30s	38s	24,570
39	6.25	60x48	30s	43s	26,325
39	6.50	56x56	30s	46s	28,392
39	6.60	56x44	28s	42s	25,740
”	”	”	28s	44s	25,740
”	”	”	29s	40s	25,740
”	”	”	29s	42s	25,740
”	”	”	30s	40s	25,740
”	”	”	30s	41s	25,740
”	”	”	30s	45s	25,740
”	”	”	33s	36s	25,740
39½	3.25	96x100	30s	42s	25,161
39½	3.40	80x84	28s	33s	22,025
39½	3.60	76x92	28s	37.50s	23,890
39½	4.00	80x80	28s	45s	25,280

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
39½	4.25	72x76	30s	40s	24,845
39½	4.25	72x80	31s	41s	25,517
39½	4.40	72x76	33s	36s	25,722
39½	4.64	72x68	30s	40s	25,659
39½	5.36	64x56	30s	40s	25,406
39½	6.00	56x56	30s	40s	26,544
39½	6.60	56x52	30s	46s	28,136
40	3.00	84x100	28s	36s	22,080
40	3.06	96x112	32s	42s	25,459
40	3.20	84x92	28s	33s	22,528
40	3.20	84x96	28.50s	36s	23,040
40	3.40	80x84	28s	33s	22,304
40	3.40	80x92	30s	36s	23,392
40	3.50	80x92	27.50s	42s	24,080
”	”	”	28s	41s	24,080
”	”	”	30s	38s	24,080
40	3.65	80x84	31s	37s	23,944
40	3.67	72x80	28s	36s	23,194
40	3.90	80x80	30s	40s	24,960
40	3.94	72x80	30s	36s	23,955
40	3.96	72x80	28s	37s	24,077
40	4.00	78x78	30s	40s	24,960
40	4.00	80x80	30s	42s	25,600
40	4.15	80x72	31s	41.50s	25,232
40	4.20	72x80	31s	41s	25,536
40	4.50	64x76	31s	42s	25,200
40	4.50	72x80	30s	46s	27,360
40	4.73	66x70	30s	43s	25,731
40	4.75	66x70	29.50s	41s	25,840
40	4.85	66x64	31s	42s	25,220
40	5.00	64x64	30s	40s	25,600
40	5.05	64x60	30s	40s	25,048
40	5.10	64x64	30s	40s	26,112
40	5.15	64x60	31s	40s	25,544
40	5.25	64x56	31s	42s	25,200
40	5.30	64x56	30s	40s	25,440
40	5.50	60x56	30s	40s	25,520
40	5.60	64x60	30s	46s	27,776
40	5.65	56x56	30s	40s	25,312
40	5.85	56x52	28s	42s	25,272
40	6.00	56x56	29s	43.75s	26,880
40	6.00	60x48	30s	40s	25,920
40	6.15	56x52	31s	44.50s	25,568

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
40	6.25	56x52	30s	43s	27,000
”	”	”	31s	42s	27,000
”	”	”	31s	44s	27,000
”	”	”	33s	36s	27,000
40	6.40	56x44	31s	40s	25,600
40	6.50	56x44	30s	40s	26,000
40	6.60	56x44	31s	44s	26,400
40	6.85	56x44	30s	46s	27,400
40	7.50	48x40	31s	42s	26,400
41	3.80	80x80	30s	40s	24,928
41	4.05	80x72	31s	41.50s	25,240
41	4.10	72x80	30s	40s	25,551
41	4.36	72x74	33s	36s	26,099
41	4.55	72x68	30s	40s	26,117
41	4.91	64x64	28.50s	41.50s	25,768
41	5.16	64x56	30s	40s	25,387
41	6.10	56x52	30s	43s	27,011
41	6.44	56x44	30s	40s	26,404
41½	4.15	80x76	31s	44s	26,867
42	5.00	56x56	30s	32s	23,520
42	5.00	64x56	31.25s	40s	25,200
42½	5.00	64x56	31s	42s	25,500
42½	6.06	56x44	30s	46s	25,755
43	3.00	84x92	28s	35s	22,704
43	3.75	80x80	30s	42s	25,800
43	3.75	80x84	30s	44s	26,445
43	4.00	68x68	28s	35s	23,392
43	4.00	80x76	30s	46s	26,832
43	4.75	64x64	30s	40s	26,144
43	5.60	56x52	30s	42s	26,006
43	5.85	56x48	30s	41s	26,161
43	5.85	56x52	30s	43s	27,167
44	3.56	72x80	28s	37s	23,809
44	3.77	80x72	31s	41.50s	25,214
44	3.81	80x84	33s	42s	27,493
44	4.50	64x64	30s	38s	25,344
44	4.65	64x60	30s	38s	25,370
44	4.70	64x64	30s	43s	26,470
44	4.88	64x56	30.50s	41s	25,766
44	5.25	56x60	30s	42s	26,796
44	5.25	60x56	30s	42s	26,796
44	6.40	48x48	30s	43s	27,034
45	3.35	78x80	28s	37s	23,818

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
45	3.70	72x76	30s	38s	24,642
45	3.70	80x72	31s	41.50s	25,308
45	3.85	80x76	31s	44s	27,027
45	4.00	72x72	30s	40s	25,920
45	4.10	72x68	31s	41s	25,830
45	4.40	64x64	31s	37s	25,344
45	4.65	64x60	30s	42s	25,947
45	4.75	64x56	30s	40s	25,650
45	5.25	56x56	28s	44s	26,460
45	5.35	60x48	31s	41s	26,001
45	5.40	56x52	30s	40s	26,244
45	5.45	56x56	29s	45s	27,468
45	5.50	56x52	31s	44.50s	26,730
45	5.50	56x56	30s	46s	27,972
45	5.55	56x56	30s	46s	27,972
45	5.85	56x44	30s	42s	26,325
”	”	”	31s	44.50s	26,325
46	4.00	72x68	31s	41.50s	25,760
46	4.00	72x72	31s	45s	26,496
46	4.50	75x44	30s	40s	24,633
46	4.61	64x56	31s	40s	25,447
46½	3.57	80x72	31s	41.50s	25,233
48	3.33	72x80	28s	38s	24,296
48	4.12	64x64	28s	44s	25,313
48	4.25	48x48	33s	36s	26,112
48	4.40	64x60	31s	43s	26,189
48	4.45	64x56	31s	41.50s	25,632
48	4.85	56x56	28s	44s	26,074
48	5.00	60x48	31s	41s	25,920
48	5.25	56x56	30s	46s	28,224
48	5.35	56x56	30s	46s	28,762
50	3.72	68x72	31s	41s	26,040
50½	3.28	80x72	31s	41.50s	25,177
51	3.00	80x80	31s	37s	24,480
51	3.35	80x76	31s	44s	26,653
51	4.20	64x56	31s	40s	25,704
51	4.27	64x56	30s	40s	26,132
51	4.80	56x56	30s	46s	27,418
51	4.90	56x52	31s	44.50s	26,989
51½	4.55	56x56	30s	42s	26,244
52	3.00	80x80	30s	41s	24,960
52	3.10	80x80	30s	42s	25,792
52	3.20	80x72	31s	41.50s	25,293

B	Y	E x P	W	F	BYT
		Printcloths (Continued)			
52	3.55	72x68	30s	40s	25,844
52	4.12	64x56	31s	40s	25,709
52	4.75	56x56	30s	46s	27,664
53	4.35	56x56	30s	40s	25,822
56	3.00	72x80	31s	40s	25,621
56	3.77	75x44	30s	40s	25,123
56	4.14	56x56	28.50s	40s	25,966
56	4.35	56x56	30s	42s	27,283
57	2.75	80x80	30s	40s	25,080
57	3.76	64x56	31s	40s	25,718
57	3.85	64x56	30s	40s	26,334
57	4.00	56x56	30s	38s	25,536
57	4.10	56x56	30s	40s	26,174
57	4.15	56x56	33s	36s	26,494
57	4.30	56x52	31s	43s	26,471
57	4.35	56x56	30s	46s	27,770
58	2.70	72x80	28s	37s	23,803
58	2.85	80x72	31s	41.50s	25,126
58	3.20	72x68	30s	40s	25,984
58	4.35	56x56	30s	46s	28,258
58½	4.00	56x56	30s	43s	26,208
59	2.50	80x88	30s	40s	24,780
59	2.80	80x72	31s	41.50s	25,110
60	3.57	64x56	31s	40s	25,704
81	2.25	60x60	28s	32s	21,870
81	2.30	72x68	30s	40s	26,082
		Medium-Fine Plains (Warp mainly 40s)			
		(For finishing into shirtings, cambrics, etc.)			
26	13.33	56x52	40s	60s	37,431
28	10.86	60x52	40s	50s	34,057
28	11.43	60x52	42s	53s	35,844
30	8.40	72x76	48s	54s	38,304
30	8.50	64x60	40s	45s	31,620
30	8.50	72x76	50s	50s	37,740
30	8.66	68x68	42s	52s	35,333
30	8.88	64x60	40s	50s	33,034
30	8.90	64x68	42s	52s	35,244
30	9.00	68x72	50s	50s	37,800
30	9.36	64x60	42s	50s	34,819
32	7.35	64x64	32s	50s	30,106
33	8.38	68x76	50s	55s	39,822
36	5.31	94x94	40s	60s	35,938

B	Y	E x P	W	F	BYT
Medium-Fine Plains (Warp mainly 40s) (Continued)					
36	5.75	96x92	50s	54s	38,916
36	6.25	80x80	40s	60s	36,000
36	6.67	72x68	40s	50s	33,617
36	9.75	60x48	42s	62s	37,908
36	10.00	60x48	42s	66s	38,880
36	10.25	56x52	50s	54s	39,852
36½	5.15	96x104	50s	54s	37,595
37½	5.50	96x92	50s	54s	38,775
38	8.50	60x52	42s	53s	36,176
39	3.85	96x112	40s	50s	31,231
39	3.95	96x108	40s	50s	31,426
39	4.10	96x100	40s	48s	31,340
39	4.15	96x100	40s	50s	31,723
39	4.20	100x116	50s	50s	35,381
39	4.65	100x116	50s	60s	39,172
39	4.75	80x88	40s	44s	31,122
39	4.95	96x104	50s	60s	38,610
39	5.00	80x80	34s	51s	31,200
”	”	”	35s	50s	31,200
”	”	”	40s	46s	31,200
39	5.00	80x88	40s	50s	32,760
39	5.00	88x92	42s	56s	35,100
39	5.00	96x100	50s	54s	38,220
39	5.25	96x92	50s	54s	38,493
39	6.00	72x68	40s	48s	32,760
39	6.00	80x76	42s	60s	36,504
39	6.00	80x80	50s	50s	37,440
39½	5.00	96x100	47s	58s	38,710
40	3.70	96x116	40s	50s	31,376
40	4.15	96x100	40s	50s	32,536
40	4.25	100x120	45s	60s	37,400
40	4.80	96x104	44s	62s	38,400
40	4.90	94x104	47s	57s	38,808
40	5.00	80x80	40s	50s	32,000
40	5.00	88x92	42s	62s	36,000
40	5.00	94x100	47s	58s	38,800
40	5.25	96x92	50s	60s	39,480
40	6.00	72x68	40s	50s	33,600
40	6.00	72x76	42s	52s	35,520
40	6.00	80x76	50s	50s	37,440
40	6.50	72x68	40s	60s	36,400
41	3.63	96x116	40s	50s	31,552
41	5.85	80x76	50s	50s	37,417

B	Y	E x P	W	F	BYT
		Medium-Fine Plains (Warp mainly 40s) (Continued)			
41	6.67	70x48	40s	45s	32,269
43	3.73	96x100	40s	50s	31,436
		Medium-Fine Plains (Warp mainly 50s) (For finishing into nainsooks, etc.)			
26	13.25	68x64	50s	72s	45,474
27	9.25	94x96	55s	75s	47,452
27	11.50	76x76	50s	78s	47,196
27	12.00	72x72	50s	80s	46,656
27	17.12	52x52	65s	60s	48,073
28	9.54	84x84	50s	75s	44,876
28	10.73	80x80	50s	83s	48,070
28	12.00	68x64	50s	70s	44,352
28	14.00	64x60	65s	60s	48,608
28	14.95	60x52	60s	60s	46,883
29	11.76	72x72	60s	70s	49,110
29	12.15	68x68	50s	83s	47,920
29	13.33	56x52	50s	60s	41,750
30	9.45	76x72	50s	60s	41,958
30	11.00	68x56	50s	60s	40,920
30	12.30	64x64	50s	75s	47,232
31	11.00	72x72	60s	70s	49,104
31	11.83	64x60	50s	75s	45,475
33	7.67	80x84	50s	65s	41,510
33	7.70	88x92	55s	68s	45,738
33	7.89	80x80	50s	65s	41,659
33	8.00	84x88	55s	68s	45,408
33	8.05	80x76	50s	65s	41,441
33	8.30	80x84	55s	68s	44,920
33	8.50	76x80	55s	60s	43,758
33	8.75	84x80	55s	75s	47,355
33	9.55	76x80	55s	80s	49,163
33	10.25	68x72	50s	75s	47,355
34	7.00	72x100	50s	60s	40,936
35	7.94	88x88	65s	65s	48,190
35	8.48	72x72	50s	65s	42,739
36	7.90	84x90	50s	80s	49,485
36	8.00	76x72	50s	60s	42,624
36	8.35	80x80	60s	70s	48,096
36	9.00	68x64	50s	65s	42,768
36	9.40	68x56	50s	60s	41,962
36	9.55	72x68	55s	75s	48,132
36	9.80	68x64	50s	75s	46,570

B	Y	E x P	W	F	BYT
Medium-Fine Plains (Warp mainly 50s) (Continued)					
36	10.00	60x48	50s	60s	41,280
36	10.00	72x60	55s	75s	47,520
36	10.13	76x60	55s	80s	49,596
36	10.25	72x56	52s	76s	47,232
36	10.65	56x52	50s	58s	41,407
36½	9.90	72x60	55s	75s	47,698
37	8.50	72x60	50s	60s	41,514
38	5.85	96x120	50s	86s	48,017
38	5.85	104x100	50s	82s	45,349
38	5.95	96x120	50s	90s	48,838
38	7.00	88x88	50s	83s	46,816
38½	6.75	96x92	55s	80s	48,856
38½	9.35	72x60	55s	75s	47,517
39	5.00	100x144	60s	70s	47,580
39	5.27	108x124	60s	70s	47,683
39	5.50	96x100	50s	65s	42,042
39	8.50	68x56	50s	60s	41.106
39	8.70	68x56	50s	65s	42,073
40	4.60	112x116	60s	60s	41,952
40	5.02	96x116	45s	73s	42,570
40	5.57	104x100	50s	82s	45,451
40	6.00	88x80	50s	60s	40,320
40	6.00	96x100	55s	75s	47,040
40	6.15	88x80	50s	60s	41,328
40	6.25	88x80	50s	65s	42,000
40	6.42	84x84	50s	65s	43,142
40	6.50	80x80	50s	60s	41,600
40	6.80	80x72	50s	60s	41.344
40	6.90	88x80	55s	70s	46,368
40	7.00	80x80	50s	70s	44,800
40	7.15	88x80	55s	75s	48,048
40	7.20	76x72	50s	65s	42,624
40	7.45	72x76	50s	70s	44,104
40	7.70	80x72	55s	70s	46,816
40	7.80	76x72	50s	80s	46,176
40	8.60	72x68	55s	75s	48,160
40	8.75	60x56	50s	58s	40.600
40	8.91	72x60	50s	83s	47,045
40	9.00	72x60	55s	70s	47,520
41	7.00	88x80	60s	70s	48,216
42	6.66	88x88	65s	65s	49,510
42	6.70	84x90	55s	75s	48,964
44	6.25	80x80	50s	70s	44,000
53	5.15	88x80	55s	70s	45,856

Fine Plains (Warp mainly 60s)

(For finishing into India linons, etc.)

B	Y	E x P	W	F	BYT
27	16.56	56x56	60s	70s	50,077
28	12.95	72x72	60s	80s	52,214
28	13.21	68x68	60s	72s	50,304
28	13.25	72x68	60s	78s	51,940
28	13.31	68x68	58s	75s	50,684
28	13.65	68x68	60s	75s	51,979
28	13.74	68x64	50s	94s	50,783
28	13.85	68x64	60s	72s	51,190
28	14.00	64x64	60s	72s	51,744
28	14.10	68x64	60s	75s	52,114
28	14.34	64x64	60s	72s	51,395
28	14.34	76x64	60s	98s	56,213
28	14.45	65x64	58s	80s	52,193
28	14.52	72x64	60s	92s	55,292
28	14.90	72x64	60s	100s	56,739
28½	14.36	76x64	60s	100s	57,296
30	9.94	96x96	60s	100s	57,254
30	10.06	92x100	60s	100s	57,946
30	10.23	96x92	60s	100s	57,697
30	10.40	92x92	60s	100s	57,408
30	10.66	88x80	60s	90s	53,726
30	10.67	92x92	60s	112s	58,898
30	10.75	88x92	60s	100s	58,050
30	10.75	92x88	60s	105s	58,050
30	10.78	80x80	65s	75s	51,744
30	11.00	84x80	60s	85s	54,120
30	11.00	88x88	60s	100s	58,080
30	11.03	92x88	60s	112s	59,562
30	11.04	84x80	60s	86s	54,317
30	11.10	88x84	60s	100s	57,276
30	11.16	76x84	60s	84s	53,568
30	11.25	80x80	60s	84s	54,000
30	11.35	88x80	60s	93s	57,204
”	”	”	60s	100s	57,204
”	”	”	60s	102s	57,204
”	”	”	60s	105s	57,204
30	11.50	80x80	60s	90s	55,200
30	11.50	88x80	60s	106s	57,960
30	11.52	88x76	60s	98s	56,678
30	11.54	76x76	65s	75s	52,622
30	11.67	80x80	60s	94s	56,016
30	11.75	76x76	60s	84s	53,580

B	Y	E x P	W	F	BYT
		Fine Plains (Warp mainly 60s) (Continued)			
30	11.75	84x80	60s	106s	57,810
30	11.80	76x72	65s	75s	52,392
30	11.92	76x76	60s	86s	54,355
30	11.99	80x76	60s	94s	56,113
30	12.00	76x72	60s	85s	53,280
30	12.25	76x72	60s	90s	54,390
30	12.50	72x72	60s	84s	54,000
30	12.50	76x72	60s	90s	55,500
30	12.63	72x72	65s	80s	54,562
30	12.99	68x68	65s	75s	52,999
30	13.00	72x68	60s	86s	54,600
30	13.91	64x64	65s	75s	53,414
30½	13.41	76x64	50s	100s	57,261
32	8.41	92x100	60s	80s	51,671
32	10.65	88x80	60s	100s	57,254
32	12.00	72x68	60s	85s	53,760
33	7.84	96x100	65s	75s	50,709
33	8.35	96x96	60s	84s	52,906
33	8.38	92x96	65s	75s	51,990
33	8.78	88x92	65s	75s	52,153
33	8.88	92x92	60s	90s	53,919
33	9.02	88x84	65s	70s	51,198
33	9.30	92x88	65s	85s	55,242
33	9.40	84x84	65s	75s	52,114
33	9.75	88x84	65s	85s	55,341
33	10.10	88x84	65s	90s	57,328
33	10.70	76x84	65s	85s	56,496
35	7.00	116x124	65s	100s	58,800
35	7.30	116x116	65s	100s	59,276
35	8.00	108x104	65s	100s	59,360
35	8.50	100x100	65s	100s	59,500
35	9.46	96x76	60s	105s	56,949
35	9.71	88x80	60s	100s	57,095
36	8.00	96x96	60s	93s	55,296
36	8.30	88x80	60s	83s	50,198
36	8.50	88x88	60s	86s	53,856
36	9.00	80x80	60s	80s	51,840
36	9.00	88x80	60s	90s	54,432
36	9.02	88x80	62s	84s	54,553
36	9.44	88x80	60s	100s	57,093
36	9.63	76x72	60s	80s	51,309
36	10.00	76x72	60s	85s	53,280
37½	9.70	76½x72	60s	86s	54,017

B	Y	E x P	W	F	BYT
		Fine Plains (Warp mainly 60s) (Continued)			
38	9.35	80x72	60s	90s	54,006
38½	6.40	104x112	60s	90s	53,222
38½	7.75	96x92	60s	100s	56,094
38½	9.35	76x72	60s	85s	53,276
38½	9.40	80x80	60s	100s	57,904
38½	11.70	76x56	65s	104s	59,459
39	6.14	110x128	70s	85s	56,991
39	8.27	88x84	60s	95s	55,475
39	8.75	88x80	60s	106s	57,330
39	10.88	68x56	60s	80s	52,616
39	11.00	68x56	60s	80s	53,196
39	11.19	68x56	60s	85s	54,115
40	5.14	124x134	70s	75s	53,045
40	5.38	126x136	70s	85s	56,382
40	6.21	104x120	60s	95s	55,642
40	6.39	104x112	60s	95s	55,210
40	6.49	108x112	62s	95s	57,112
40	6.50	108x112	60s	100s	57,200
40	6.52	100x92	60s	80s	50,074
40	6.59	96x100	60s	80s	51,666
40	6.60	96x100	60s	80s	51,744
40	6.66	96x100	60s	85s	52,214
40	6.70	96x96	60s	80s	51,456
40	6.76	96x100	60s	87s	52,998
40	6.90	96x100	60s	88s	54,096
40	6.98	96x100	60s	87s	54,723
40	7.00	96x100	60s	92s	54,880
40	7.00	104x104	60s	110s	58,240
40	7.02	96x100	70s	72s	55,037
40	7.03	104x106	60s	108s	59,052
40	7.06	96x102	60s	90s	55,915
40	7.07	96x100	60s	90s	55,429
40	7.11	96x92	60s	100s	53,467
40	7.25	96x92	60s	90s	54,520
40	7.50	88x80	60s	80s	50,400
40	7.50	96x92	60s	100s	56,400
40	7.56	96x92	60s	102s	56,851
40	7.80	88x80	60s	85s	52,416
40	8.00	84x92	65s	85s	56,320
40	8.05	88x80	60s	100s	54,096
40	8.08	88x80	60s	88s	54,298
40	8.27	88x84	60s	100s	56,898
40	8.40	88x80	60s	97s	56,448

B	Y	E x P	W	F	BYT
		Fine Plains (Warp mainly 60s) (Continued)			
40	8.50	88x80	60s	95s	57,120
”	”	”	60s	98s	57,120
”	”	”	60s	100s	57,120
”	”	”	60s	102s	57,120
”	”	”	62s	95s	57,120
40	8.62	76x72	60s	82s	51,030
40	8.75	80x76	60s	90s	54,600
40	8.93	80x76	60s	95s	55,123
40	8.94	72x68	60s	83s	50,064
40	9.00	76x72	60s	84s	53,280
40	9.00	80x76	60s	95s	56,160
40	9.00	80x80	60s	100s	57,600
40	9.47	76x72	60s	95s	56,062
40	9.50	72x68	60s	83s	53,200
40	9.65	72x60	60s	75s	50,952
40	9.65	76x72	60s	100s	57,128
40	9.78	72x68	60s	90s	54,768
40	11.00	76x56	65s	100s	58,080
41	6.52	100x92	60s	80s	51,525
42	7.00	124x76	70s	95s	58,800
43	6.66	96x100	60s	100s	56,130
44	8.04	76x72	60s	87s	52,356
44	8.35	80x76	60s	100s	57,314
45	7.12	88x80	60s	100s	53,827
45	7.22	88x80	60s	88s	54,583
45	7.50	88x80	60s	100s	56,700
45	8.00	76x72	60s	80s	53,280
54	6.20	88x80	60s	100s	56,246
		Fine Plains (Warp mainly 80s) (For finishing into organdies, etc.)			
30	10.75	96x96	60s	130s	61,920
30	11.50	88x88	60s	120s	60,720
30	11.75	88x84	60s	125s	60,630
30	11.75	88x92	60s	130s	63,450
30	11.75	104x110	80s	130s	75,435
30	12.75	96x100	80s	130s	74,970
30	13.00	88x76	75s	90s	63,960
30	16.46	80x80	90s	120s	79,008
30	17.65	76x64	80s	120s	74,130
32	15.15	80x76	80s	130s	75,629
32	15.36	76x68	80s	110s	70,779
32	15.58	76x64	80s	105s	69,798

B	Y	E x P	W	F	BYT
		Fine Plains (Warp mainly 80s) (Continued)			
33	9.75	96x92	80s	80s	60,489
33	10.10	96x96	80s	90s	63,994
33	10.22	96x100	80s	95s	66,103
33	10.75	96x104	80s	110s	70,950
33	14.28	60x68	70s	90s	60,319
33	15.00	60x64	70s	90s	61,380
33	16.00	60x64	80s	90s	65,472
33	16.00	76x72	90s	120s	78,144
33	17.00	64x70	80s	120s	75,174
33	17.30	68x72	90s	120s	79,926
33	17.39	64x72	90s	120s	78,046
33	18.00	56x52	75s	95s	64,152
33	18.00	64x68	90s	120s	78,408
33	19.00	48x48	65s	95s	60,192
35	7.70	108x116	70s	100s	60,368
35	9.59	96x108	80s	100s	68,473
35	10.00	96x100	80s	100s	68,600
35	10.23	96x92	80s	100s	68,313
35	10.56	96x100	80s	115s	72,442
35	10.99	96x84	80s	110s	69,237
36	8.50	104x104	80s	90s	63,648
36	9.00	112x112	80s	120s	72.576
36	9.45	112x120	90s	120s	78,926
36	10.39	96x96	80s	120s	71,816
36	10.52	92x92	80s	110s	69,684
36	10.66	96x104	80s	130s	76,752
37	8.00	100x124	80s	100s	66,304
37	8.50	100x110	80s	95s	66,045
37	8.56	100x136	80s	120s	74,746
37	8.61	100x104	80s	95s	64,988
37	8.74	100x120	80s	110s	71,144
37	9.05	96x100	75s	100s	65,631
37½	9.43	96x100	80s	104s	69,310
38½	12.56	84x80	90s	120s	79,304
39	9.35	104x100	80s	130s	74,389
40	6.40	116x124	80s	85s	61,440
40	7.31	124x112	90s	100s	69,006
40	8.00	96x100	75s	95s	62,720
40	8.41	96x108	80s	105s	68,626
40	8.43	112x108	90s	110s	74,184
40	8.51	96x96	80s	95s	65,357
40	8.74	96x100	80s	105s	68,522
40	8.75	100x96	80s	105s	68,600

B	Y	E x P	W	F	BYT
		Fine Plains (Warp mainly 80s) (Continued)			
40	9.00	84x92	75s	95s	63,360
40	9.00	96x100	80s	110s	70,560
40	9.00	104x100	80s	125s	73,440
40	9.07	96x100	80s	110s	71,109
40	9.11	104x100	85s	120s	74,338
40	9.35	96x92	80s	105s	70,312
40	9.40	96x92	80s	110s	70,688
40	9.60	88x80	80s	90s	64,512
40	9.65	80x80	60s	120s	61,760
40	9.65	92x96	90s	100s	72,568
40	10.50	84x80	70s	135s	68,880
40	10.50	88x80	80s	105s	70,560
40	10.55	84x80	80s	100s	69,208
40	10.56	96x92	90s	120s	79,411
40	11.00	76x68	80s	85s	63,360
40	11.00	84x80	80s	110s	72,160
40	11.00	84x84	80s	120s	73,920
40	11.54	88x84	90s	120s	79,395
40	11.74	88x80	90s	120s	78,893
40	12.35	76x68	80s	110s	71,136
40	13.00	72x56	80s	95s	66,560
40	13.00	72x64	80s	110s	70,720
40	13.50	72x68	80s	140s	75,600
40	13.50	76x68	90s	120s	77,760
42	6.47	112x124	80s	95s	65,218
42	8.08	112x108	90s	110s	74,659
42	8.13	108x112	90s	110s	75,121
42	8.40	80x92	80s	80s	60,682
43	6.35	116x124	80s	95s	65,532
43	7.84	112x108	90s	110s	74,166
45	8.80	96x96	90s	110s	76,032
45	9.43	84x80	80s	105s	69,593
45	9.50	80x76	80s	100s	66,690
45	10.00	76x68	80s	90s	64,800
45	10.15	80x76	80s	110s	71,253
45	11.40	72x68	80s	110s	71,820
45¼	5.87	114x126	80s	90s	63,748
45¼	6.04	116x124	80s	95s	65,594
46	9.15	88x84	80s	120s	72,395
46	10.69	76x68	80s	110s	70,781
46¼	9.33	80x76	80s	100s	67,316
48½	8.75	88x88	80s	110s	71,610
50	7.20	88x80	80s	80s	60,480

B	Y	E x P	W	F	BYT
		Extra-Fine Plains (Warp mainly 100s)			
		(For finishing into Persian lawns, etc.)			
30	12.00	116x118	100s	125s	84,240
30	12.28	128x128	110s	150s	94,310
30	13.25	112x112	100s	140s	89,040
30	14.00	108x120	110s	140s	95,760
30	14.00	112x108	110s	140s	92,400
32	13.97	104x108	110s	140s	94,772
32	14.52	104x100	110s	140s	94,787
32	14.88	100x92	100s	145s	91,423
32	15.64	96x96	100s	165s	96,092
32	15.94	84x80	100s	120s	83,653
32	16.38	88x96	100s	160s	96,445
32	16.42	88x84	100s	140s	90,376
32	16.44	92x92	110s	150s	96,799
32	16.70	88x88	100s	150s	95,054
32	17.31	80x80	100s	130s	88,627
33	10.98	120x126	100s	140s	89,136
33	11.36	112x124	100s	140s	88,472
33	11.68	108x120	100s	140s	87,880
33	11.90	100x108	90s	130s	81,682
33	12.10	104x112	100s	130s	86,249
33	17.00	68x76	90s	120s	80,784
33	17.00	76x76	100s	120s	85,272
33	17.00	76x80	100s	130s	87,516
34	13.54	104x108	110s	150s	97,596
36	9.09	120x128	100s	120s	81,156
36	9.50	120x116	100s	120s	80,712
36	10.66	104x112	100s	120s	82,892
37½	11.42	108x108	100s	160s	92,502
39	8.80	120x120	100s	120s	82,368
40	9.35	104x110	95s	120s	80,036
40	9.91	108x104	90s	150s	84,037
40	11.00	96x100	100s	130s	86,260
40	11.42	88x88	95s	120s	80,397
40	12.35	96x92	100s	150s	92,872
40	13.10	88x84	100s	140s	90,128
40	13.25	84x84	100s	140s	89,040
40	14.25	76x68	90s	130s	82,080
40	14.98	64x70	90s	120s	80,293
43	8.53	116x124	100s	140s	86,030
45	9.86	104x108	110s	140s	94,064
45	9.98	104x112	110s	150s	97,006
45	11.20	96x96	110s	150s	96,768

B	Y	E x P	W	F	BYT
Extra-Fine Plains (Warp mainly 100s) (Continued)					
45	11.23	84x84	100s	125s	84,899
45	11.25	84x80	100s	120s	83,025
45	11.42	88x88	100s	140s	90,446
45	11.88	88x88	110s	140s	94,090
53	10.45	88x80	100s	150s	93,047
Extra-Fine Plains (Warp mainly 120s) (For finishing into French lawns, etc.)					
32	15.75	104x112	120s	160s	108,864
32	15.75	108x116	120s	180s	112,896
34	13.75	116x128	120s	180s	114,070
34	14.10	112x124	120s	180s	113,138
40	14.50	96x100	120s	180s	113,680
40	16.00	92x84	130s	160s	112,640
45	10.66	112x124	120s	180s	113,209
45	11.20	108x116	120s	180s	112,896

Section B—SPECIAL PLAINWOVEN COTTON CLOTHS, IN THE GRAY

B	Y	E x P	W	F
		Typewriter Cambrics		
37½	5.75	158x140	87s	84s
38	4.99	130x142	68s	73s
38	6.63	124x126	80s	90s
38	6.64	140x160	92s	110s
38½	5.27	120x140	68s	72s
38½	5.50	128x120	70s	70s
39	4.89	142x160	70s	85s
39	5.06	143x154	80s	80s
39	5.43	142x166	90s	90s
39	6.10	126x156	80s	105s
39	6.40	136x144	85s	100s
39	6.45	124x158	90s	100s
40	5.00	142x154	71s	83s
40	5.19	138x146	80s	80s
40	5.75	128x156	78s	95s
40	5.95	120x136	80s	80s
40	7.72	128x142	100s	120s
41½	5.16	143x135	80s	80s
41½	5.36	128x143	80s	80s
41½	6.09	128x128	80s	90s
42	3.92	144x152	70s	70s
42	4.52	134x150	70s	80s
42	4.60	148x158	80s	85s
42	5.00	124x144	60s	100s
42	5.00	126x138	70s	80s
42	5.08	140x154	70s	100s
42	5.20	136x152	80s	90s
42	5.24	126x134	70s	85s
42	5.34	138x152	80s	90s
42	5.35	158x158	100s	100s
42	5.55	132x140	80s	90s
42	5.65	136x136	80s	90s
42	5.89	140x152	90s	100s
42	6.38	124x132	80s	100s
42	6.59	125x127	90s	90s

B	Y	E x P	W	F
		Typewriter Cambrics (Continued)		
42	6.86	124x132	90s	100s
42	7.20	124x140	90s	120s
43	4.71	138x146	70s	85s
43	5.02	126x134	70s	80s
43	6.40	128x128	90s	90s
44	5.85	125x125	80s	90s
45	5.65	144x126	90s	90s
45¼	6.10	114x126	80s	90s
57	4.22	134x126	80s	85s
		Balloon Cloths		
40	6.21	126x136	80s	90s
40½	3.85	94x90	38s	38s
41	6.15	120x128	78s	87s
42	2.47	100x93	75/3	75/3
42	4.78	108x100	53s	52s
42½	6.81	134x148	95s	105s
44	5.90	116x128	80s	90s
		Filter Cloth		
28	7.17	112x112	60s	60s
		Tracing Cloths		
35	7.94	88x88	65s	65s
35	8.00	84x90	60s	70s
35	8.48	88x88	65s	75s
40	7.80	76x72	60s	65s
42	6.66	88x88	65s	65s
42	6.70	84x90	60s	70s
42	7.11	88x88	65s	75s
48	5.86	84x90	60s	70s
		Dimity Cords		
26	11.10	76x48	42s	62s
26½	10.20	83x56	42s	70s
27	11.01	102x120	85s,50s	110s
27	12.00	94x72	100s,50s	120s
27	12.56	88x58	65s	75s
27	13.06	90x60	60s	90s
27	15.15	105x108	100s,85s	150s
27½	14.91	88x72	100s,43s	110s
28	13.31	100x72	100s,43s	110s
29	10.91	90x60	50s	98s

B	Y	E x P	W	F
		Dimity Cords (Continued)		
30	11.68	89x68	70s,45s	94s
36	8.37	94x68	60s	83s
36½	7.11	114x64	60s	70s
36½	9.18	116x76	60s	90s
		Pongees and Soisettes		
25	7.00	96x104	60s	40s
25	7.30	84x108	60s	40s
25	7.80	84x112	80s	40s
26	6.10	84x112	50s	37s
26	6.80	76x92	50s	33s
26	7.00	84x108	60s	40s
28½	8.63	80x90	85s	43s
29	7.31	64x72	50s	30s
30	7.10	64x72	50s	30s
31	7.25	68x108	80s	41s
33½	6.95	68x94	70s	39s
34	5.20	76x104	50s	37s
34	6.08	64x72	50s	30s
34	6.40	64x72	50s	33s
34	6.50	64x108	80s	41s
34	6.75	68x100	80s	40s
34	6.75	68x108	70s	44s
”	”	”	78s	43s
”	”	”	80s	41s
34	6.75	72x100	70s	44s
34	6.99	68x108	85s	43s
34	7.00	68x96	60s	46s
34	7.00	68x104	80s	44s
34	7.00	72x100	80s	41s
34½	6.62	67x108	78s	42s
37	5.40	64x84	45s	33.50s
38	4.85	60x72	40s	28s
38	5.75	64x72	50s	33s
38	5.92	72x100	60s	48s
38	6.00	68x96	70s	40s
38	6.25	72x100	60s	50s
38½	5.47	70x100	65s	42s
39	5.84	80x108	85s	43s
41½	6.33	68x100	80s	50s
43	3.21	84x124	50s	33s
43	4.90	76x104	80s	40s
50	3.80	96x100	60s	40s

B	Y	E x P	W	F
		"Single" Poplins		
27	5.25	100x44	30s	24s
27¾	4.60	96x40	24s	21s
28	5.14	101x48	30s	25s
28½	4.50	118x38	40s	12s
28½	4.70	122x40	50s	12s
37	3.30	112x44	30s	20s
37	3.49	100x48	25s	25s
37	3.65	112x46	30s	29.50s
37	3.75	99x44	30s	23s
37	3.80	100x44	30s	25s
37	3.90	99x44	30s	25s
37	3.90	100x44	29.50s	28.50s
37	3.95	100x44	30s	24s
37	4.25	100x44	30s	30s
37½	2.85	112x44	31s	13s
37½	3.25	116x56	30s	24s
37½	3.50	116x52	30s	30s
37½	3.90	100x44	30s	24s
37½	4.00	100x44	30s	25s
38	2.89	114x58	31s	13s
38½	3.10	92x52	30s	16s
		"Semi" Poplins		
27	5.90	104x42	60/2	29s
27	7.50	103x46	80/2	36s
28	4.65	112x40	50/2	30s
28	4.65	114x38	50/2	30s
28	4.87	102x48	50/2	28s
28	5.27	101x48	60/2	25s
28	5.50	101x48	60/2	30s
36	3.65	104x48	55/2	24s
36	3.90	96x40	50/2	25s
37	3.40	88x40	40/2	25s
37½	2.72	102x64	46/2	22s
37½	4.10	80x40	50/2	21s
38	2.25	102x56	40/2	17s
38	2.32	102x58	40/2	20s
38½	2.28	102x64	38/2	19s
38½	2.38	102x58	40/2	19s
38½	3.20	100x51	46/2	25s
40	2.00	102x60	43/2	13s
40	2.25	102x54	40/2	17s
44½	2.01	102x55	40/2	18s

B	Y	E x P	W	F
		"Ply" Poplins		
28	5.50	104x48	60/2	60/2
37	3.40	88x40	45/2	40/2
40½	2.78	144x70	84/2	43/2
		"Single" Broadcloths		
36	5.00	80x60	32s	42s
36½	4.16	152x80	48s	48s
36½	4.85	80x60	30s	40s
36½	4.90	80x60	31.25s	45s
36½	5.00	80x60	30s	40s
"	"	"	30s	41s
"	"	"	30s	43s
"	"	"	30s	44s
"	"	"	30s	45s
"	"	"	30.70s	43.50s
"	"	"	31s	42s
"	"	"	31s	43s
"	"	"	31s	44s
"	"	"	31s	45s
36½	5.10	80x56	30s	40s
36½	5.15	80x56	30s	41s
37	3.68	152x80	50s	40s
37	3.79	152x80	45s	48s
37	3.80	112x60	31s	45s
37	3.80	136x60	40s	36s
37	3.85	112x60	30s	40s
"	"	"	30s	47s
37	3.90	140x70	42s	40s
37	3.95	116x60	34.50s	43s
37	3.96	144x76	45s	44s
37	4.00	100x60	29.50s	43.50s
"	"	"	30s	40s
37	4.00	108x60	30s	43s
37	4.00	116x60	31s	45s
37	4.00	128x68	40s	42s
37	4.00	136x60	39s	43.10s
"	"	"	40s	40s
"	"	"	40s	44s
"	"	"	42s	38s
37	4.00	144x76	45s	45s
37	4.00	152x80	50s	45s
37	4.03	128x68	40s	44s
37	4.05	144x76	50s	39s

B	Y	E x P	W	F
		"Single" Broadcloths (Continued)		
37	4.07	136x60	38.50s	43s
37	4.09	144x76	50s	40s
37	4.10	100x60	29s	41s
"	"	"	30s	40s
"	"	"	30s	41s
"	"	"	30.50s	44s
"	"	"	30.70s	41.50s
"	"	"	31s	40s
"	"	"	31s	42s
"	"	"	31s	44s
"	"	"	32s	40s
37	4.11	80x60	30s	43s
37	4.20	152x80	50s	49s
37	4.30	128x68	40s	45s
37	4.35	140x78	44s	56s
37	4.39	128x68	40s	50s
37	4.40	112x60	40s	33s
37	4.40	128x60	40s	42s
37	4.40	128x64	40s	45s
37	4.40	128x68	42s	45s
37	4.50	128x68	44s	44s
37	4.50	144x68	50s	45s
37	4.50	144x76	50s	50s
37	4.50	172x88	60s	60s
37	4.60	132x64	45s	45s
37	4.75	80x60	30s	40s
37	5.00	80x60	30.50s	42s
37½	2.83	144x78	37s	26s
37½	3.50	112x60	31s	31s
37½	3.85	112x60	31s	40s
37½	4.00	136x60	39s	43s
37½	4.15	144x76	50s	40s
37½	4.25	140x76	44s	54s
37½	4.30	128x68	42s	44s
37½	4.32	90x60	31s	38s
37½	4.35	142x78	45s	56s
37½	4.50	132x76	50s	45s
37½	4.50	144x76	50s	50s
37½	4.65	144x76	54s	50s
38	4.15	144x74	48s	48s
38½	4.14	150x68	50s	45s
38½	4.25	144x76	50s	45s
38½	4.80	80x60	31s	45s

B	Y	E x P	W	F
		"Single" Broadcloths (Continued)		
39	4.60	80x60	30s	43s
39½	5.00	144x76	60s	60s
40	3.68	136x60	40s	40s
40	3.95	144x76	47s	52s
41	3.06	150x76	47s	27s
43	5.40	112x64	60s	50s
		"Semi" Broadcloths		
37	3.80	114x64	66/2	32s
37	3.90	140x70	80/2	45s
37	4.00	120x64	80/2	30s
37	4.00	122x62	80/2	30s
37	4.00	124x60	80/2	30s
37	4.00	136x68	80/2	40s
37	4.10	120x64	76/2	36s
37	4.25	120x72	80/2	40s
37	4.30	128x68	80/2	45s
37	4.40	124x60	80/2	40s
37½	3.70	134x61	80/2	30s
37½	3.75	120x62	80/2	30s
37½	3.80	122x64	80/2	30s
37½	3.80	134x57	80/2	30s
37½	3.85	108x60	58/2	46s
37½	3.92	124x64	80/2	30s
37½	4.00	134x61	80/2	40s
37½	4.10	134x57	80/2	40s
37½	4.40	115x64	80/2	40s
37½	4.50	144x76	100/2	50s
37½	5.00	124x64	100/2	50s
41	4.60	134x57	100/2	50s
		"Ply" Broadcloths		
37	4.35	148x78	100/2	100/2
37	4.40	140x76	92/2	100/2
37	4.50	144x76	100/2	100/2
37	4.65	156x58	100/2	100/2
37½	4.00	134x61	80/2	80/2
37½	4.10	116x72	80/2	80/2
37½	4.35	144x80	94/2	110/2
37½	4.35	152x76	100/2	100/2
37½	4.40	158x66	100/2	100/2
37½	4.50	144x76	100/2	100/2
38	4.20	114x71	80/2	80/2

B	Y	E x P	W	F
		"Ply" Broadcloths (Continued)		
38½	3.85	140x74	90/2	80/2
38½	4.00	144x76	100/2	80/2
38½	4.14	150x68	100/2	90/2
40	4.25	140x78	100/2	100/2
40½	3.70	164x84	100/2	120/2
40¾	2.39	144x85	71/2	71/3
		"Single" Voiles		
39	8.70	60x52	50s	50s
39	8.88	60x52	50s	52s
39	9.07	60x52	49s	52s
39	9.33	68x76	68s	70s
39	9.57	60x48	60s	50s
40	8.12	60x56	50s	50s
40	8.25	60x56	50s	50s
40	8.35	60x54	50s	50s
40	8.52	60x52	50s	50s
40	8.75	60x56	50s	50s
40	8.78	68x76	70s	70s
40	8.83	56x52	50s	50s
40	9.00	60x57	53s	54s
40	9.00	64x64	60s	60s
40	9.17	52x52	50s	50s
40	9.30	64x60	60s	60s
40	9.60	60x60	60s	60s
40	9.86	60x56	60s	60s
41	7.93	60x60	50s	50s
45	7.33	60x56	50s	50s
45	8.82	60x56	60s	60s
		"Semi" Voiles		
40	7.80	60x56	50s	96/2
40	9.00	60x56	60s	100/2
40	10.00	64x64	70s	140/2
40	10.66	64x60	90s	110/2
		"Ply" Voiles		
27	8.32	49x46	60/2	60/2
27	9.00	34x34	45/2	45/2
34	9.50	62x56	100/2	100/2
38½	9.00	64x64	120/2	120/2
40	8.00	60x56	96/2	96/2
40	8.09	60x56	100/2	100/2

B	Y	E x P	W	F
		"Ply" Voiles (Continued)		
40	8.00	62x56	100/2	100/2
40	8.95	60x56	110/2	110/2
40	9.10	64x60	120/2	120/2
40	9.95	64x64	140/2	140/2
40	10.90	60x56	140/2	140/2
40	14.50	70x64	200/2	200/2
41	8.00	60x56	100/2	100/2
42½	7.32	59x57	93/2	104/2
43	7.65	60x56	100/2	100/2
45	8.83	60x64	140/2	115/2
45	9.50	72x72	160/2	160/2
45	10.40	68x72	180/2	180/2
		Crepe Kimono Cloths		
37	4.95	68x72	31s	40s
37	5.00	68x72	30.50s	42s
39	6.00	56x40	40s	20s
39	6.50	56x40	34s	31s
40	5.12	56x40	31s	22s
41	5.20	56x40	34s	19s
41	5.32	58x40	36s	20s
		Airplane Cloths		
36	4.00	80x80	60/2	60/2
36¼	3.97	80x84	62/2	62/2
36½	4.00	80x84	60/2	64/2
38	3.75	80x80	60/2	60/2
39	3.52	80x84	56/2	64/2
42	3.40	84x80	60/2	62/2
		Curtain Scrims		
35½	4.56	24x24	21/2	21/2
36	4.30	24x24	20/2	20/2
36	4.53	24x24	21/2	21/2
36	4.65	21x26	31/3	31/3
36	5.43	25x27	28/2	28/2
36	5.50	40x30	36/2	36/2
36½	4.38	24x24	20/2	20/2
40	2.75	28x28	20/2	13/2
40	4.08	24x24	20/2	20/2
40	5.15	30x28	30/2	30/2
48	3.40	24x24	20/2	20/2
49	5.60	14x14	20/2	20/2

B	Y	E x P	W	F
		Beach Cloths		
37	2.75	36x36	20/2	20/2
37	3.00	36x30	20/2	20/2
42	2.20	46x44	20/2	20/2
		Flannelets		
21	10.12	38x24	28s	10s
25	5.00	36x44	20s	11s
26	4.85	36x44	20s	11s
27	4.45	56x50	26s	12.50s
27	5.00	36x44	25s	11s
27½	4.75	48x41	19s	12s
28	4.75	47x41	19s	12s
28	4.85	36x44	25s	11s
29	4.45	42x44	26.50s	10.30s
29	5.47	42x44	26.50s	13.60s
29½	4.98	42x44	26.50s	12.50s
30	5.10	48x48	26.50s	15s
31	4.70	44x44	26.50s	13s
31¾	4.39	44x48	28s	12s
32	3.90	36x42	20s	10s
32	4.37	48x48	26.50s	13s
32	4.55	42x44	26.50s	12.50s
32	5.43	42x44	26.50s	15.25s
33	3.48	50x40	25s	11s
33½	3.51	49x41	26s	11s
36	3.66	54x52	21s	16s
37	3.50	44x40	18s	12.25s
39	3.50	48x42	26.50s	11.15s
40	3.50	44x48	30s	12s
40	3.60	45x38	22s	12s
40	3.80	43x40	24.50s	12.50s
40	3.91	42x46	26.50s	13.75s
40	4.02	42x44	26.50s	13.75s
40	4.25	43x40	24.50s	15s
40½	2.65	44x48	18s	10.25s
40½	3.20	40x44	22s	12s
40½	3.25	44x44	21s	12s
41	3.80	46x42	20s	16s
41¼	3.70	40x44	32s	11.50s
42	2.16	46x44	22s	7.50s
42	2.65	46x44	22s	9.60s
42	3.00	45x38	22s	9.60s
42	3.29	45x38	22s	11s

B	Y	E x P	W	F
		Flannelets (Continued)		
42	4.50	45x38	22s	19s
42½	1.86	49x43	22s	6.30s
42½	2.25	49x43	22s	8s
42½	2.33	48x37	22s	7s
42½	2.45	48x34	22s	7s
42½	3.10	44x46	20s	13s
42½	3.34	48x34	22s	10.50s
42½	3.97	48x37	22s	16s
43	3.00	45x38	22s	10s
44½	3.01	32x36	22s	8.75s
48	4.50	44x20	28s	10s
51½	3.00	42½x40	25s	12.50s

Section C—TWILLS AND SATEENS, IN THE GRAY

B	Y	E x P	W	F
		Drills (coarse 3-leaf warp twills)		
21	3.92	72x48	13.50s	13.20s
24	4.06	68x40	13s	17s
24	4.56	76x46	18s	18s
24	5.30	68x48	19s	21s
25	3.50	66x52	14s	14s
25	3.60	68x52	14s	15s
25	3.80	68x40	12.75s	16s
26	3.18	72x48	13.50s	13.50s
26	3.75	68x44	13s	20s
27	2.85	72x48	12s	14s
27	3.16	70x48	12s	16s
27	3.20	70x46	13s	15s
28½	2.85	72x48	13s	13.50s
29	2.51	72x52	13.50s	10.60s
29	2.59	68x58	12.25s	13.50s
29	2.82	72x48	13.50s	13.30s
29	2.83	72x48	12.25s	15.50s
29	2.85	66x44	12s	12s
29	2.85	69x48	13.50s	13.25s
29	2.85	72x48	13.50s	13.50s
29	2.95	72x48	13.50s	14.50s
29½	2.85	70x48	13s	14s
30	2.40	68x40	10.50s	12.50s
30	2.45	76x60	14s	14s
30	2.50	68x48	12.50s	11.75s
30	2.50	68x56	13s	13s
30	2.50	68x60	12.25s	14s
30	2.50	70x48	13.50s	10s
30	2.50	70x52	13s	12.50s
30	2.50	72x48	13s	12.50s
30	2.50	72x60	13.50s	13s
”	”	”	13.50s	14s
”	”	”	13.65s	13.50s
”	”	”	14s	12.50s
30	2.50	72x52	13s	13s
30	2.50	76x54	13s	16s
30	2.50	76x58	14s	14.50s

B	Y	E x P	W	F
		Drills (Continued)		
30	2.60	68x44	12.75s	11s
30	2.65	68x40	12s	12s
30	2.65	68x46	12s	13s
30	2.65	70x48	13s	13s
30	2.65	72x44	12.25s	15s
30	2.72	72x48	13.50s	13.20s
30	2.80	72x46	12.75s	16s
30	2.85	66x44	12s	14.25s
30	2.85	70x48	13s	15s
30	2.85	71x48	14s	14s
30	2.85	72x46	14s	12.50s
30	2.85	72x48	13.50s	14.50s
”	”	”	14.25s	13s
30	2.85	80x44	12s	22s
30	2.86	69x48	12.33s	15.50s
30	2.88	68x46	13s	13s
30	2.90	72x30	12.25s	11s
30	2.93	68x44	12.75s	15s
30	3.00	65x44	12.75s	13s
30	3.00	66x44	13s	14s
”	”	”	13.60s	14.25s
30	3.00	66x46	13.50s	13.50s
30	3.00	68x40	13s	13.50s
30	3.00	68x42	12.25s	14.25s
30	3.00	68x44	13.65s	12.80s
30	3.00	68x46	14s	14s
30	3.00	68x48	13s	14s
30	3.00	70x44	13s	15s
30	3.00	70x48	12s	20s
”	”	”	13s	16s
30	3.00	72x46	14s	14s
30	3.10	66x48	14s	15s
30	3.25	60x44	13s	15s
30	3.25	68x40	13s	15s
”	”	”	13s	17s
”	”	”	14s	14.50s
”	”	”	14s	16s
30	3.25	68x42	13s	18s
30	3.25	68x46	15s	15s
30	3.25	68x48	14s	18.50s
30	3.25	70x40	13s	18s
30	3.28	68x46	13s	18s
30	3.48	54x40	12.75s	14s

B	Y	E x P	W	F
		Drills (Continued)		
30	3.50	68x40	15s	15s
30	3.50	68x46	13s	22s
30	3.65	76x46	18s	18s
30	3.70	66x44	13.60s	23s
30	3.75	66x44	18.25s	14.25s
30	3.85	64x48	15s	22s
30	3.95	76x46	18s	22s
30	4.00	66x44	18s	15.50s
30	4.00	68x38	18.25s	14.25s
30	4.00	68x40	17s	17s
30	4.00	68x48	20s	16s
30	4.00	70x48	17.50s	20s
30	4.30	68x40	20s	16s
30	5.25	60x40	22s	18s
30	5.25	64x32	22s	16s
30½	2.45	70x50	13.50s	10.50s
30½	2.70	72x48	12s	16s
30½	2.85	70x48	13s	16s
30½	2.86	72x44	13.50s	13.50s
31	2.90	68x44	13.50s	13.50s
31	3.05	68x40	12.50s	16.50s
31½	2.62	68x56	14s	14s
31½	2.62	72x48	12s	16s
31½	2.90	70x46	13s	16s
32	2.58	72x48	12.25s	14.50s
32	2.69	70x46	13.50s	13.25s
32	3.06	68x48	14s	18s
33	2.50	72x48	13.50s	13.20s
33	2.72	68x44	13.50s	14s
34	4.75	60x36	21s	20s
34½	2.38	68x56	14s	14s
36	2.00	68x56	12.50s	11.75s
36	2.25	68x56	14s	14s
36	2.35	80x44	12s	22s
36	2.71	68x48	13.50s	18s
37	1.93	68x56	13.50s	11.50s
37	2.35	68x34	12.25s	12s
37	2.35	68x40	13s	12s
37	2.35	76x42	13.50s	14.50s
37	2.42	66x44	12.50s	13.50s
37	2.50	68x40	13s	14s
37	2.50	72x44	14s	14s
37	2.50	72x60	16s	17s

B	Y	E x P	W	F
		Drills (Continued)		
37	2.65	66x44	13.60s	16s
37	2.65	68x31	12.25s	13.25s
37	2.65	68x40	13s	17s
37	2.65	70x40	13.50s	16s
37	2.75	66x40	13.50s	16s
”	”	”	16.50s	13s
37	2.75	68x40	13s	18s
”	”	”	20s	10.50s
37	3.00	66x44	18s	13s
37	3.00	68x36	13s	22s
37	3.00	68x40	16s	16s
37	3.25	68x40	17s	17s
”	”	”	18s	15.50s
37	3.50	64x40	16.50s	20s
37	3.50	66x40	17s	18.60s
37	3.50	68x40	18s	18s
37	3.75	68x40	18s	24s
37	3.95	66x36	18s	23s
37	3.95	68x40	20s	25s
37½	2.00	72x54	13s	12s
37½	2.00	72x60	13s	14s
37½	2.00	76x54	13s	13.50s
38	1.89	72x60	13.25s	13.50s
38	2.00	72x48	12s	13s
38	2.35	70x48	13s	16s
38	2.60	62x40	12.25s	15s
38½	1.93	72x48	12s	12s
38½	1.93	72x60	13.25s	14.50s
39	1.50	94x60	14s	10s
39	1.58	78x48	13.65s	8.50s
39	2.50	68x40	13s	17s
39½	1.55	70x48	9.75s	10.25s
40	1.55	70x48	12s	7.75s
40	1.56	70x48	11s	9.50s
40	2.03	70x48	13.50s	13s
40	2.25	64x48	13.50s	15s
40	2.29	68x42	12.25s	16s
40	2.35	68x44	13s	17s
40	2.40	68x40	13s	16s
40	2.50	68x40	13s	18s
40	3.25	68x40	17s	21s
41	2.41	62x40	12.25s	15.75s
42	3.08	68x40	17s	21s

B	Y	E x P	W	F
		Drills (Continued)		
46	1.75	72x42	13s	12s
46	2.00	70x42	13s	16s
46	2.06	72x48	13s	20s
46	2.68	68x40	17s	21s
46	2.75	64x36	17s	16s
46½	1.85	76x48	12s	22s
46½	2.01	68x42	13.50s	15.25s
46½	2.12	62x40	12.25s	16s
48½	2.04	62x40	14s	14s
49	1.68	72x48	13.50s	13.50s
51	1.81	70x42	13s	16.50s
51½	1.80	67x42	13.50s	13.50s
52	1.73	68x48	13.50s	16s
52	1.75	68x42	13.50s	13.50s
52	1.90	62x40	12.25s	15.25s
52	1.90	68x40	13.50s	15.50s
52	2.20	68x40	22s	12s
53	1.20	76x44	12.25s	8.50s
54	1.55	76x40	13.50s	13.50s
54	1.83	62x40	13.50s	13.50s
54	1.93	62x40	13.50s	15.50s
54½	1.70	68x42	13.50s	13.50s
56	1.64	82x48	14s	22s
56	1.70	70x44	13.50s	16s
56	1.93	64x38	13s	18s
58	1.55	72x42	13.50s	15.50s
58	1.60	65x41	13.50s	12.50s
58	1.60	68x40	13.50s	14s
58	1.60	62x40	13.50s	15.50s
59	1.57	65x41	13.50s	12.50s
59	1.76	62x40	13.50s	15.50s
59	1.85	62x40	17s	13s
59	1.85	68x40	14s	20s
”	”	”	17s	15s
59	2.25	62x40	20s	17s
59	2.25	68x40	21s	17s
60	1.53	70x44	13s	16s
60	2.00	68x40	18s	15.50s
65	1.43	65x41	13.50s	12.50s
65	1.60	62x40	13.50s	15.50s
		Jeans (closewoven drills)		
29½	5.53	96x64	22s	24.50s

B	Y	E x P	W	F
		Jeans (closewoven drills) (Continued)		
29½	3.75	84x56	21s	21s
30	3.50	96x64	21s	26s
30	4.00	86x56	21s	27s
30	4.10	100x64	24s	36s
30	4.25	80x56	22s	25s
30	4.25	84x48	22s	24s
30½	3.33	96x64	21s	24s
31	3.87	84x56	21s	26s
31½	3.22	96x64	21s	24s
32	3.28	96x64	22s	24.50s
36	3.40	100x64	24s	36s
38	2.85	96x54	22s	22s
38	2.85	96x64	22s	26s
”	”	”	23.50s	24.50s
”	”	”	23.75s	22.50s
”	”	”	24s	24s
”	”	”	24.25s	21.50s
38	3.00	96x64	22s	30s
38	3.15	84x56	21s	26s
39	2.75	96x64	22s	24.50s
39	2.89	96x64	28s	22s
39	3.00	96x64	24s	28s
39	3.10	96x64	24s	30s
39	3.30	96x64	24s	36s
40½	2.59	96x64	22.50s	23.50s
58	2.25	84x56	22s	28s
		3-Leaf Warp Twills		
29	5.25	80x60	26.50s	33s
30	5.00	96x64	30s	36s
34	4.75	60x36	29s	40s
37	4.50	96x60	30s	44s
38	4.20	96x60	30s	40s
39	3.90	80x80	29s	39s
39	4.50	68x68	30s	36s
”	”	”	31s	34s
39	4.85	66x68	29s	40s
39	5.10	64x64	28.50s	40s
39	5.25	64x56	28.50s	38s
39	5.35	64x58	30s	45s
39	6.00	64x48	28.50s	44s
39	6.25	60x48	30s	40s
39	6.60	56x44	29s	40s

B	Y	E x P	W	F
		3-Leaf Filling Twills		
43	4.00	68x68	28s	35s
43	4.00	80x76	30s	44s
43	4.30	68x60	28s	36s
43	4.75	68x52	28s	40s
43	6.00	64x48	34s	42s
26½	6.80	64x68	32s	29s
26½	6.82	64x72	32s	31s
30½	3.85	68x76	21s	25s
31	3.15	68x80	18s	22s
31	3.85	68x80	22s	25s
31	4.00	64x72	21s	25s
31	4.20	64x70	21s	25s
31	4.20	68x80	24s	27s
32	5.32	64x80	28s	36s
33½	2.67	68x86	28s	15s
35	5.00	68x72	30s	36.50s
36	4.20	60x80	25s	30s
38½	3.49	68x72	28s	22s
39	3.00	68x70	22s	24s
”	”	”	23s	22s
”	”	”	24s	21s
39	3.00	68x76	21s	25s
39	3.00	68x80	22s	25s
39	3.10	76x88	25s	29s
39	3.25	68x76	22s	27s
39	3.50	68x80	24s	31s
39	3.50	80x92	28s	35s
39	3.50	96x100	30s	42s
39	3.65	80x92	30s	36s
39	3.75	80x84	28s	36s
39	4.00	68x68	28s	30s
39	4.00	68x76	28.50s	31s
”	”	”	30s	30s
39	4.13	68x72	28s	30s
39	4.20	68x72	30s	30s
39	4.25	68x76	28s	36s
”	”	”	31.25s	34s
39	4.50	68x68	31.25s	34s
39	4.50	68x76	28s	40s
39	4.80	64x72	30s	38s
”	”	”	30s	40s
39	4.80	68x72	30s	40s
39	5.10	64x64	30s	40s

B	Y	E x P	W	F
		3-Leaf Filling Twills (Continued)		
39	5.10	64x104	36s	50s
39	5.35	64x88	36s	46s
40	2.20	70x72	22s	14s
40	2.94	66x64	26.50s	17s
40	3.99	76x84	30s	38s
40	4.30	64x96	38s	34s
40	4.50	62x88	40s	35s
43	2.70	80x100	27s	29s
43	3.25	80x92	28s	36s
43	3.35	72x120	30s	44s
43	3.55	68x76	28s	30s
43	3.65	64x112	30s	42s
43	3.65	68x112	30s	44s
43	3.65	80x92	30s	44s
43	3.85	62x104	40s	35s
43	3.85	64x104	30s	44s
”	”	”	38s	34s
43	4.00	68x76	30s	36s
43	4.50	68x76	30s	44s
43	4.75	68x72	30s	46s
43½	3.51	80x108	33s	44s
44	3.30	78x90	30s	35.50s
44	3.58	80x120	33s	50s
46½	4.00	64x80	40s	34s
99	1.05	68x80	20.25s	21.75s
		3-Leaf Twills, Combed		
37	7.58	84x80	60s	58s
43	4.68	88x140	60s	65s
		4-Leaf Warp Twills		
27¾	4.60	96x40	24s	21s
28	2.65	104x48	18s	11s
29	2.00	104x54	15s	11s
29½	2.00	88x48	13.50s	9s
29½	2.15	88x48	12.25s	10s
29½	2.15	104x48	15s	11s
29½	2.30	88x56	15s	12s
29½	2.40	86x52	13.50s	13.60s
29½	2.40	88x56	13.50s	14s
29½	2.50	88x37	13.50s	10s
29½	2.50	88x56	13s	19s
29½	2.50	108x48	16s	15s

B	Y	E x P	W	F
		4-Leaf Warp Twills (Continued)		
29½	2.65	108x52	18s	15s
29½	2.65	144x48	24s	15s
29½	2.85	104x48	20s	13s
29½	3.00	88x37	15s	15s
30	1.85	66x42	9.25s	7.75s
30	2.00	88x42	11s	10s
30	2.00	88x48	12s	10s
30	2.00	90x58	13s	12s
30	2.00	98x42	12s	10s
30	2.10	88x56	13s	11s
30	2.10	88x58	12s	12s
30	2.12	80x42	11s	10s
30	2.15	88x48	12s	11s
30	2.25	108x52	18s	11s
30	2.31	88x48	13s	13s
30	2.31	104x48	15s	12s
30	2.40	88x48	13s	14s
30	2.50	88x38	12s	13.88s
30	2.50	88x48	13s	15s
30	2.50	104x48	18s	11s
30	2.50	120x52	20s	13s
30	2.65	88x38	13s	14s
30	2.65	104x48	18s	13s
30	2.70	80x37	13.50s	11s
30	2.85	88x38	15s	14s
30	3.00	86x40	18s	12s
30	3.00	88x36	15s	16s
30	3.00	98x42	18s	14s
30	3.00	120x50	24s	16s
30	3.25	88x38	17s	15s
30	3.25	120x48	24s	18s
30	3.50	88x38	17s	16.60s
30	4.00	112x48	28s	22s
30½	2.16	88x54	14s	11s
30½	3.93	86x50	24s	18s
31	1.48	88x56	10s	8s
31	1.96	88x56	14s	10s
31	2.00	80x56	10.50s	12.50s
31	4.20	88x38	24s	18s
31½	1.75	88x50	12.25s	9s
31½	2.05	88x56	13s	13s
32	2.00	96x44	14s	10.20s
33½	1.73	86x52	13.50s	8s

B	Y	E x P	W	F
		4-Leaf Warp Twills (Continued)		
34	3.25	48x40	15s	12s
36	1.90	88x48	13s	13s
37	1.50	76x42	9s	9s
37	1.50	80x44	9s	10s
37	1.75	76x42	11s	10s
37	1.75	86x40	13s	10s
37	1.75	86x44	13s	10s
37	1.75	88x42	13.50s	9.50s
37	1.83	104x42	15s	11s
37	1.85	108x52	18s	11s
37	1.95	76x42	12.50s	10s
37	2.00	76x42	13s	10s
37	2.00	86x40	13s	13s
37	2.00	86x44	13s	14s
37	2.00	88x42	13.50s	12s
37	2.05	88x40	13s	14s
37	2.09	92x68	20s	15s
37	2.10	86x44	13.50s	13s
37	2.35	76x42	13s	14s
37	2.35	80x44	13s	18s
37	2.35	86x42	15s	15s
37	2.35	88x40	13s	18s
37	2.45	76x42	13s	17s
37	2.50	76x42	13s	18s
37	2.65	68x40	13s	17s
37	2.65	76x42	13s	21s
37	2.65	86x44	15s	21s
37	2.65	116x52	20s	26s
37	2.85	68x38	13s	21s
37	2.85	88x40	17s	21s
37	3.00	68x40	13s	22s
37	3.00	88x37	20s	16s
37	3.00	88x40	20.50s	16s
37	3.00	116x52	28s	20s
37	3.25	116x52	28s	24s
37	3.50	112x50	28s	28s
37	3.95	112x46	28s	36s
38	2.50	118x60	25s	21s
38	3.50	112x60	31s	32s
38½	3.05	120x64	30s	24s
39	1.90	76x40	12.50s	10s
39	2.50	108x56	21s	24s
39	2.66	76x42	15s	19s

B	Y	E x P	W	F
		4-Leaf Warp Twills (Continued)		
39	4.80	68x68	28.43s	39.45s
39¼	1.68	88x56	14s	11s
40	3.50	100x60	31s	32s
48	1.54	76x42	13s	10s
50	1.48	76x42	13s	10s
53	1.05	72x44	9s	9s
54	1.55	76x40	13s	14s
58	.96	76x42	9s	9s
58	1.30	76x40	13s	10s
58	1.35	68x56	13s	14s
59	1.76	76x44	18s	15s
59	2.00	88x56	24s	20s
60	1.26	72x42	12.25s	10s
60	1.64	68x40	13.50s	15s
65	1.16	76x42	12.25s	10.50s
		4-Leaf Filling Twills		
31	4.20	64x100	24s	32s
31	4.20	68x80	30s	24s
35	2.72	72x120	24s	26s
35	3.00	72x120	24s	30s
38½	4.00	64x80	30s	28s
40	2.38	72x120	24s	26s
40	4.10	64x104	30s	42s
40	4.30	64x96	38s	34s
42½	3.85	64x104	30s	40s
43	2.22	70x120	24s	26s
43	3.35	72x120	30s	42s
43	3.35	84x124	40s	40s
43	3.65	64x112	30s	42s
43	3.85	64x104	38s	34s
59	1.40	48x64	12s	13s
		Alberts (5-leaf filling twills)		
35	4.00	64x80	27s	27s
35	4.00	68x80	27s	29s
35	4.40	64x80	28s	30s
35	4.40	70x78	28s	32s
35	4.85	64x88	29s	39s
35	4.85	70x76	30s	35s
35	5.00	68x72	30s	35.50s
35	5.10	64x80	29s	40s
35	5.10	70x80	30s	40s

B	Y	E x P	W	F
		Alberts (5-leaf filling twills) (Continued)		
35	5.40	64x72	29s	39s
35	5.50	64x72	29s	40s
36	4.55	76x92	33s	40s
		Gabardines		
		(Steep warp twills made with 11 or more harnesses)		
36	3.20	124x80	30s	30s
37½	3.25	116x72	30s	30s
38	1.40	128x52	22/2	20s
39½	1.72	124x72	30/2	25s
39½	1.85	110x78	17s	20s
40	1.70	120x72	30/2	24s
40	1.75	110x76	16s	20s
40	1.75	124x80	20s	19s
”	”	”	22s	16.50s
40	1.75	128x72	30/2	30s
40	2.00	110x76	20s	20s
40	2.00	124x76	22s	20s
44	2.05	128x64	40/2	30s
44	2.05	128x64	40/2	60/2
45	1.59	124x76	31/2	31s
		5-Harness Warp Sateens		
21½	3.43	130x84	24s	20s
21½	3.80	130x72	24s	22s
26½	3.75	127x88	28s	30s
27	4.32	115x68	26.50s	32s
27½	2.50	96x56	14s	14s
27½	3.70	112x64	22s	28s
27½	3.70	118x64	24s	24s
27½	4.33	124x60	28s	32s
29	4.20	112x64	28s	30s
30	2.85	88x30	14s	12s
30	2.85	88x38	14s	14s
30	2.88	93x64	16s	22s
30½	2.25	112x64	22s	11.25s
30½	2.51	112x64	22s	14.50s
30½	2.65	118x64	24s	15s
30½	2.66	112x64	22s	15.40s
30½	2.67	144x104	26.50s	32s
30½	2.92	144x84	26.50s	32s
30½	2.97	120x64	22s	21.50s
30½	3.00	112x64	22s	21.75s

B	Y	E x P	W	F
		5-Harness Warp Sateens (Continued)		
30½	3.00	114x84	22s	28s
30½	3.00	118x64	22s	22s
30½	3.30	118x64	24s	24s
30½	3.34	104x64	22s	22.50s
30½	3.35	112x64	22s	28s
”	”	”	24s	22s
30½	3.35	118x64	24s	24s
30½	3.38	136x76	28s	34.50s
30½	3.50	112x64	26.50s	21.50s
30½	4.00	112x64	28s	30s
32	2.29	130x84	24s	20s
32	2.52	112x64	22s	15.40s
32	2.56	130x72	24s	22s
32	2.65	104x84	24s	19s
32	2.88	124x60	24s	22s
32	3.00	106x52	21s	20s
32	3.07	112x64	22s	26s
32	3.23	112x56	24s	22s
33½	2.15	118x72	20s	18s
34	2.00	118x64	22s	12s
34	2.07	150x80	24s	20.50s
34	2.18	130x84	24s	20s
34	2.25	118x72	20s	20s
34	2.39	130x72	24s	22s
34	2.39	144x104	26.50s	32s
34	2.45	112x64	22s	16s
34	2.49	104x84	24s	19s
34	2.50	104x84	22s	19.70s
34	2.61	144x84	26.50s	32s
34	2.70	124x60	24s	22s
34	3.00	104x56	23s	21s
34	3.00	108x56	22s	22s
34	3.00	112x64	22s	28s
34	3.04	112x58	24s	22s
34	3.04	136x76	28s	34.50s
34	3.07	103x64	22s	22.50s
34	3.60	108x60	28s	26s
36	2.31	124x72	24s	22s
36	2.32	140x88	24s	30s
36	2.35	104x84	22s	19.70s
36	2.66	112x56	22s	24.50s
36	2.67	130x72	24s	30s
36	4.50	112x64	36s	42s

B	Y	E x P	W	F
		5-Harness Warp Sateens (Continued)		
36½	2.63	106x52	21s	20s
37	2.25	120x64	22s	16.90s
37½	1.89	124x80	20s	20s
37½	2.23	104x84	22s	19.70s
37½	3.50	112x64	24s	45s
37½	3.65	112x64	28s	40s
38	2.00	118x64	22s	14.50s
38	4.40	96x56	29s	40s
38½	2.13	144x104	26.50s	32s
39	1.93	130x84	24s	20s
39	2.00	112x64	22s	14.50s
39	2.09	130x72	24s	22s
39	2.18	104x84	22s	19.70s
39	2.30	118x60	24s	19s
39	2.34	124x60	24s	22s
39	2.46	112x56	22s	24.50s
39	2.58	103x64	22s	22.50s
39	2.67	112x56	24s	22s
40	3.00	112x64	28s	28s
42	3.50	112x64	30s	40s
42	3.50	140x84	42s	44s
42½	2.75	96x64	24s	26s
42½	3.50	112x64	30s	42s
42½	3.75	96x64	30s	40s
42½	3.90	96x60	30s	40s
42½	4.00	96x56	30s	40s
42¾	1.98	104x84	22s	21s
43	1.32	96x48	13s	8s
43	3.35	160x96	52s	44s
43	3.45	140x96	44s	50s
43	3.50	112x64	36s	32s
43	3.50	120x84	40s	42s
43	3.50	120x96	42s	44s
43	3.50	136x96	44s	50s
43	3.75	96x64	30s	40s
43½	3.42	126x96	40s	47s
44	3.37	140x96	45s	50s
53	1.05	108x64	17s	9.25s
53	1.07	96x56	14s	9.40s
53	1.14	108x64	17s	11s
53	1.32	96x64	16s	13s
53½	1.20	108x64	15s	15s
53½	1.30	108x64	15s	17s

B	Y	E x P	W	F
		5-Harness Warp Sateens (Continued)		
54	1.05	85x64	12.25s	10.50s
54	1.05	96x64	13.50s	11s
54	1.30	93x60	13.50s	16s
54	1.30	104x64	15s	17s
54	1.55	96x60	17s	18.50s
55	1.08	93x60	13.50s	11s
55	1.18	108x64	15s	15s
56	1.05	96x64	13.50s	12s
58	1.20	96x64	15s	15s
		5-Harness Warp Sateens, Combed		
37½	6.50	128x68	60s	70s
38	5.09	200x96	70s	95s
38	5.60	155x84	60s	80s
38	5.65	144x88	60s	75s
38	5.75	140x76	60s	70s
38	5.75	140x90	60s	80s
38	3.75	144x72	60s	70s
38	3.75	150x86	60s	85s
38	5.75	164x86	70s	80s
38	5.85	150x81	60s	85s
38	5.90	140x90	60s	85s
38	5.90	164x88	70s	90s
38	6.00	140x76	60s	75s
38	6.00	140x90	60s	94s
38	6.00	144x90	60s	95s
38	6.00	166x90	70s	95s
38	6.10	152x78	60s	100s
38	6.15	140x90	60s	100s
38	8.03	180x96	100s	140s
38½	5.75	140x90	60s	80s
38½	5.75	144x88	60s	85s
38½	5.75	156x82	60s	95s
38½	5.79	188x88	80s	90s
38½	5.85	180x92	80s	90s
38½	5.90	166x90	70s	95s
38½	6.00	140x90	70s	70s
38½	6.00	150x81	70s	70s
38½	6.00	166x80	70s	90s
38½	6.00	168x88	70s	96s
38½	6.00	180x88	80s	90s
38½	6.00	188x88	80s	100s
38½	6.20	141x90	70s	80s

B	Y	E x P	W	F
		5-Harness Warp Sateens, Combed (Continued)		
39	5.25	160x88	60s	80s
39	5.50	144x88	60s	75s
39	5.90	144x88	60s	95s
39	5.90	168x88	70s	95s
39	6.00	168x80	70s	90s
39	6.00	168x88	70s	100s
42	7.49	112x76	70s	90s
43	5.26	160x116	70s	105s
		5-Harness Filling Sateens		
25	6.50	72x96	36s	35s
25	6.70	72x92	36s	35s
26	6.72	72x84	36s	35s
36	6.90	72x80	26s	35s
26	7.00	64x72	28s	36s
28	5.85	64x88	28s	36s
31	4.00	72x120	28s	36s
31	4.20	64x112	28s	32s
31½	5.20	64x104	34s	38s
31½	5.36	64x88	30s	38s
31½	5.50	64x88	32s	37s
31½	5.50	64x112	30s	50s
31½	5.50	64x124	34s	48s
31½	6.07	64x96	34s	46s
32	5.25	72x88	36s	35s
35	3.75	64x112	26s	34s
35	3.75	84x124	30s	42s
35	3.97	68x130	40s	36s
35	4.46	64x112	32s	37s
35	4.50	64x112	30s	42s
35	4.65	64x104	32s	38s
35	5.25	64x80	32s	37s
35	5.50	64x72	28s	40s
36	4.50	64x96	29s	38s
36	4.50	64x104	32s	38s
36	4.50	64x112	34s	41s
36	4.85	64x88	36s	34s
36	5.10	64x80	32s	37s
36	5.25	64x72	28s	39s
36½	2.07	60x160	20s	22s
37½	3.90	64x112	30s	37s
37½	4.00	64x104	32s	37s
37½	4.15	64x112	30s	41s

B	Y	E x P	W	F
		5-Harness Filling Sateens (Continued)		
37½	4.25	64x96	30s	36s
37½	4.37	64x104	34s	38s
”	”	”	35s	36s
”	”	”	36.50s	33.50s
”	”	”	40s	33s
37½	4.65	64x88	32s	37s
37½	4.70	64x88	29s	42s
”	”	”	36.50s	33.50s
”	”	”	38s	32s
”	”	”	38s	33s
”	”	”	40s	33s
37½	4.90	64x80	32s	37s
37½	4.90	64x88	32s	40s
37½	5.00	64x80	32s	38s
37½	5.25	64x72	28s	42s
37½	5.25	64x80	32s	42s
38	4.20	64x124	40s	40s
38	4.40	80x124	40s	50s
38½	4.25	76x132	40s	50s
38½	4.25	84x136	45s	47s
”	”	”	40s	50s
38½	4.45	80x124	40s	52s
39	3.20	72x120	28s	36s
39	3.35	96x136	36s	44s
39	3.35	96x160	40s	50s
39	3.46	68x150	33s	44s
39	3.50	72x120	30s	40s
”	”	”	38s	32s
39	3.50	96x160	40s	52s
39	3.75	64x112	30s	37s
39	3.75	64x124	30s	41s
39	3.75	84x124	32s	47s
39	3.75	96x132	36s	50s
”	”	”	40s	45s
39	3.99	64x112	36s	34s
39	4.00	64x104	32s	37s
39	4.00	64x112	28s	42s
39	4.05	84x136	40s	50s
39	4.15	64x104	36s	34s
39	4.17	64x104	32s	37s
39	4.20	64x104	29s	43s
”	”	”	34s	38s
39	4.25	64x96	32s	37s

B	Y	E x P	W	F
		5-Harness Filling Sateens (Continued)		
39	4.25	84x136	44s	50s
39	4.25	96x136	44s	56s
39	4.50	64x88	36s	34s
39	4.70	64x72	36s	30s
39	4.75	64x80	32s	38s
39	5.00	64x72	30s	40s
40	2.89	84x108	28s	32s
40	3.56	96x136	40s	45s
43	3.35	72x120	30s	42s
43	3.35	84x124	36s	40s
43	3.35	96x132	36s	48s
43	3.35	96x150	36s	54s
43	3.65	64x112	30s	42s
43	3.85	64x104	34s	39s
44	3.75	64x112	34s	41s
44	4.00	64x104	34s	42s
46½	4.00	64x80	40s	34s
52	3.40	64x88	40s	33s
		5-Harness Filling Sateens, Combed		
26	7.35	96x132	60s	54s
30	6.50	96x140	60s	58s
33	5.63	104x180	60s	75s
33½	5.31	91x140	60s	50s
33½	5.50	96x150	52s	66s
35	4.62	104x160	50s	60s
38	4.53	84x136	60s	45s
38½	4.21	84x136	45s	47s
38½	4.25	84x136	52s	45s
39	3.73	96x180	40s	65s
39	4.25	96x160	50s	60s
39	4.50	96x160	50s	65s
39	4.50	96x180	60s	65s
39	5.10	88x140	60s	58s
		8-Harness Warp Sateens (For finishing into Venetians)		
32	2.90	176x88	36s	25s
34	3.35	136x80	36s	25s
34	3.65	152x76	40s	30s
35	2.85	156x64	30s	23s
35	3.10	156x64	30s	30s
35	3.18	156x64	30s	33s

B	Y	E x P	W	F
		8-Harness Warp Sateens (Continued)		
38	2.66	144x64	30s	23s
38	2.85	156x64	30s	30s
38	2.90	156x64	30s	33s
33	3.50	152x76	80/2	25s
33½	3.00	168x72	80/2	20s
34	4.25	192x76	100/2	50s
35	2.85	156x64	60/2	25s
35	3.00	156x64	60/2	30s
38	2.63	156x64	60/2	25s
38	2.75	156x64	60/2	30s
58	2.15	152x72	80/2	30s
58	1.88	184x92	80/2	36s
		Army-uniform Twills (4-harness)		
30	2.27	108x56	36/2	24/2
34½	2.00	98x54	36/2	24/2
39	1.66	86x56	27/2	20/2
”	”	”	27/2	10s
”	”	”	13.50s	10s
39	1.79	106x56	36/2	24/2
39	2.50	108x56	21s	24s
39¼	1.65	112x58	18s	12s
39½	1.75	108x56	36/2	24/2
40	1.67	108x60	36/2	25/2
”	”	”	36/2	12.50s
”	”	”	18s	12.50s
40	1.68	106x56	36/2	23/2
40	1.70	106x56	36/2	24/2
40	1.76	104½x56	36/2	12s
40	2.35	105x56	40/2	40/2
40½	1.70	104x58	36/2	24/2
42½	1.65	107x57	36/2	24/2
42½	1.68	107x58	36/2	24/2
44	1.54	111x55	36/2	24/2
44½	1.60	107x58	36/2	24/2
45	1.50	108x56	36/2	24/2
		Wind-resistant Byrd Cloth (4-harness twills)		
39¾	2.60	184x84	80/2	80/2
40½	2.45	184x100	80/2	80/2
		Army Wind-resistant Sateens (5-harness)		
39¾	1.60	103x70	36/2	24/2

B	Y	E x P	W	F
Army Wind-resistant Sateens (5-harness) (Continued)				
40	1.60	108x70	36/2	24/2
40	1.60	112x66	36/2	24/2
41¾	1.48	107x70	36/2	22/2
42½	1.58	107x58	36/2	24/2
43¾	1.41	107x70	36/2	22/2
45½	1.39	107x68	36/2	24/2

Section D—SPECIAL CLOTHS OTHER THAN PLAINWOVEN

B	Y	E x P	W	F
		Flannel Twills (3- and 4-leaf)		
25	5.25	72x40	30s	11s
25½	5.25	86x46	25s	19.50s
26	5.31	64x44	28s	13s
27	3.90	80x42	30s	11s
27	3.99	64x46	26.50s	9.75s
27	4.50	81x48	25s	15s
27	5.00	81x48	25s	19.50s
27½	2.60	74x48	21.50s	6.50s
27½	2.75	96x52	22s	9.75s
27½	3.00	72x48	22s	8s
28	2.47	88x54	14s	11.20s
28	3.30	78x48	21.50s	9.75s
28	3.60	72x38	20s	11s
28	3.75	76x48	21.50s	12.50s
28	4.00	76x48	25s	12.50s
29	2.73	67x42	22s	6.10s
29	3.50	67x44	22s	9.75s
29	3.50	73x48	21.50s	11.75s
29½	2.67	64x42	14s	8s
30	2.00	72x48	21.50s	5.50s
30	2.50	68x47	12.25s	10s
30	3.00	73x52	21.50s	9.75s
30	3.25	73x52	21.50s	11.75s
31	1.60	88x56	12s	8s
31	1.75	88x38	12s	5.35s
31	2.25	75x46	22s	5.95s
31	2.73	64x46	22s	7.25s
32	1.43	71x42	19s	3.50s
32	2.90	69x52	21.50s	9.75s
32	3.25	72x60	25s	13.50s
32¼	2.65	60x45	22s	7s
32½	1.60	71x42	19s	3.90s
33½	1.73	86x52	13.50s	8s
34	1.33	65x38	10s	3.75s
34	1.33	72x40	13.50s	4s
34	1.60	62x36	14s	3.75s

B	Y	E x P	W	F
	Flannel Twills (3- and 4-leaf) (Continued)			
34	2.00	64x44	18.50s	5.50s
34	2.00	64x52	20s	6.50s
35	2.18	64x44	17s	6.80s
B	Y	E x P	W	F
36	3.50	63x48	21.50s	15s
36½	3.00	59x48	25s	10.65s
37	2.00	68x40	16.50s	7s
37	2.35	68x40	16.50s	9s
38	1.95	67x48	21.50s	6.50s
40	2.01	64x46	22s	7s
40	3.06	63x40	22s	12.15s
40½	2.19	64x48	22s	8.24s
42½	1.78	72x42	19s	6.80s
45	2.53	56x42	26s	8s
46	2.78	56x30	26.50s	7.45s
	Filter Twills (4-leaf, 2 up and 2 down)			
36	25	34x22	8/4	7/5
36	20.50	34x24	8/4	10/4
36	20.50	40x24	7/3	7/3
36	20.36	34x30	7/3	7/3
36	19.21	34x30	10/4	10/4
36	18.80	36x30	8/3	8/3
36	18.60	36x26	8/3	7/3
36	18.50	66x36	10/2	13/4
36	17.28	66x27	15/3	12/4
36	17	36x28	8/3	9/3
36	17	38x29	9/3	9/3
36	16.75	36x30	13/4	11/4
36	15.50	36x31	13/4	13/4
36	15	66x42	10/2	13/2
36	14.50	66x36	16/3	11/2
	Chain Filter Cloths (4-leaf broken twills)			
36	20	40x30	8/3	8/3
36	18.62	64x38	16/3	16/5
36	16.34	54x38	13/3	13/3
36	14.61	54x42	13/3	13/2
36	11.82	56x50	13/3	14/2
	Corset Coutils (Herringbone twills and warp sateens)			
27	4.57	112x64	30s	25s

B	Y	E x P	W	F
		Corset Coutils (Continued)		
28	3.17	142x96	30.50s	24s
28	3.45	140x92	70/2	70/3
37½	3.50	112x64	30s	30s
38	1.70	104x80	17s	17s
38	1.85	124x84	24s	18s
38	1.90	104x76	22s	15s
38	2.15	96x88	22s	15s
38	2.15	104x80	22s	20s
38	2.25	96x80	22s	20s
38	2.26	100x72	22s	18s
38	2.53	112x56	22s	22s
38	2.70	112x56	22s	24.50s
38	2.73	108x56	24s	20s
38	3.00	100x56	24s	22s
40	2.75	96x70	24s	24s
54	1.50	100x92	21s	21s
54	1.59	140x99	62/2	24s
54	1.68	112x110	54/2	54/2
		Momie Crepes (crepe effect by granite weave)		
37	4.95	68x72	31s	40s
37	5.00	68x72	30.50s	42s
37	5.00	76x72	31s	45s
37	5.15	66x64	30s	40s
		Pajama Checks (carded dimities)		
28	5.71	74x64	34s	24s
31½	6.75	64x56	31s	43s
31½	7.10	60x52	29s	38s
32	6.15	64x54	32s	37s
32	6.85	64x54	32s	39s
36½	4.00	88x88	29s	41s
36½	4.15	80x88	29s	40s
36½	4.27	80x80	30s	40s
36½	4.70	72x80	30s	40s
”	”	”	30s	41s
”	”	”	31s	43s
36½	5.00	72x72	30s	40s
36½	5.20	66x72	28.50s	40s
36½	5.20	72x66	30s	40s
36½	5.40	66x64	28.50s	40s
36½	5.75	64x60	30s	39s
”	”	”	30s	40s

B	Y	E x P	W	F
		Pajama Checks (carded dimities) (Continued)		
36½	5.85	64x60	30s	40s
37	4.00	88x80	30s	38s
37	4.80	74x72	30s	40s
37	5.50	64x56	31s	40s
38	3.75	96x80	29s	40s
38	4.00	88x80	29s	42s
38	4.25	80x80	29s	42s
38	4.35	80x76	30s	42s
38	4.50	76x72	29s	40s
38	4.65	72x74	28.50s	41s
38	5.00	72x60	28.50s	40s
38½	4.60	72x74	28.50s	40s
38½	4.85	68x64	31s	40s
38½	5.50	64x56	31s	45s
39	4.00	80x80	31s	43s
39	4.05	80x80	30.50s	39.50s
39½	4.00	80x80	30.50s	40s
”	”	”	31s	44.50s
40	3.65	88x80	30s	40s
40	3.65	88x88	31s	41s
		Lawn Checks (combed dimities)		
27	9.25	78x78	42s	70s
27	9.25	94x96	55s	70s
27	9.60	78x72	42s	70s
27	10.50	70x70	42s	70s
27	10.77	81x76	50s	71s
27	11.00	83x80	55s	75s
28	10.31	84x80	55s	70s
28	10.50	82x78	54s	74s
30	11.50	80x76	60s	85s
30	11.75	80x66	60s	75s
30	11.82	80x70	60s	80s
33	8.75	84x80	55s	70s
		Satin-Stripe Shirtings (dobby-woven)		
34	5.10	94x80	42s	40s
34½	5.16	105x90	50s	50s
38	4.50	80x76	29s	46s
38	4.65	76x76	28.50s	47s
38½	4.25	84x80	29s	46s
38½	4.45	80x76	29s	48s
38½	4.60	76x76	28.50s	47s
38½	5.00	72x66	28.50s	47s

B	Y	E x P	W	F
		Clipped-Spot Lawns (dobby-woven)		
27	10.30	72x70	60s	85s,16s
27¼	11.40	72x65	60s	85s,16s
28	7.25	139x73	80s	85s,12s
28	9.89	68x70	60s	76s,12s
28	13.75	92x80	80s	110s,16s
39	5.38	80x75	60s	84s,10s
39	5.60	80x74	60s	84s,10s
39	6.33	80x70	60s	84s,10s
		Curtain Madras (clipped designs)		
36	8.25	52x64	50s	60s,22s
40	7.25	54x76	60s	85s,22s
40	8.80	54x63	60s	85s,22s
40	10.29	42x41	68s	58s,10s
		Mosquito Nettings (leno-woven)		
36	8.63	28x46	24s	38s
41	12.15	37x16	34.50s	44.50s
58	13.75	20x10	30s	32s
58	9.62	28x14	30s	32s
68	8.21	28x14	30s	32s
108	5.17	28x14	30s	32s
		Plain Marquisettes (leno-woven)		
28	18	52x34	120/2	120/2
29½	11.17	59x32	80/2	80/2
30½	14.50	40x28	40s	40s
36	5.50	42x30	20s	12s
36	6.90	36x18	20s	12s
38½	11.76	44x18	40s	40s
38½	13.80	40x18	40s	40s
38½	14.00	36x20	40s	40s
39½	9.70	60x34	50s	50s
39½	10.80	48x28	40s	50s
39½	11.20	52x30	50s	50s
39½	11.65	54x30	50s	50s
39½	12.15	44x18	40s	40s
40	11.00	40x28	40s	40s
45	9.53	50x36	100/2	100/2
49	9.35	52x30	50s	50s
		Clipped-Spot Marquisettes (leno-woven)		
		(Clipped design made from picks of 4 to 8 hank roving)		
38½	11.90	38x16/23.2	40s	40s,8HR

B	Y	E x P	W	F
Clipped-Spot Marquisettes (leno-woven) (Continued)				
39½	12.42	36x16/21.33	40s	40s,8HR
46	5.33	48x20/30	50s	50s,6HR
46	5.46	52x24/30	50s	50s,4HR
46	5.95	46x20/28	50s	50s,6HR
46	6.76	48x22/25.66	45s	50s,4HR
46	7.03	48x22/26.9	45s	50s,6HR
46	7.29	48x22/38.5	40s	40s,8HR
	(Clipped design made from ends of ply yarn)			
46	6.33	46/56x26	50s,20/2	50s
Birdseye Diaper Cloths				
18¾	7.83	62x46	30s	14s
19¾	6.82	64x52	28s	15s
20¼	6.00	64x64	28s	15s
22¼	6.15	64x52	28s	15s
24¼	5.62	64x52	28s	15s
26	5.14	64x52	28s	15s
26	5.28	64x64	28s	18s
28	6.24	64x52	30s	22s
29	4.50	64x46	25s	15s
29	4.80	64x64	28s	18s
29	5.50	60x52	32s	18s
29	5.75	56x46	31s	17s
29¼	4.55	64x52	28s	15s
32¼	4.15	64x52	28s	15s
Gauze Diaper Cloths				
40	7.90	44x40	30s	41s
41	7.70	44x40	31s	42s
41½	6.80	53x42	31s	44.50s
Bedford Cords ("Warp piques")				
27	4.95	104x80	30s	40s
28	4.50	104x84	30s,25s	44s
29	3.54	155x80	24s,24/2	40s
29	4.10	124x86	26s	50s
36	2.27	66½x56	22½/2	16s
36	4.40	92x64	30.50s	42s
37	3.65	104x76	30.50s	39.50s
"	"	"	31s	41s
37	3.80	104x72	30s	40s
37	3.80	104x84	34.50s	39s
37	3.85	112x60	31s	43.50s

B	Y	E x P	W	F
		Bedford Cords ("Warp piques") (Continued)		
37	4.10	100x60	31s	43.50s
37	4.40	92x64	31s	40s
37½	3.41	103x80	27s	38s
38	2.67	150x140	40s,20s	50s
38	3.42	176x100	50s,20s	83s
38	3.45	140x88	40s	40s
38½	3.68	124x112	40s	50s
39	3.50	103x76	31s	44.50s
		Piques (dobby-woven)		
28	2.24	155x223	77s,82/2	90s,11s
28	2.87	135x230	67s,68/2	78s,17s
36	1.64	100x168	30s,30/2	30s,9s
37½	2.96	109x120	50s,60/2	50s,12s
38	2.22	144x176	60s,60/2	70s,12s
38	2.58	136x170	50s,60/2	70s,30/2
38	2.67	108x136	60s,60/2	48s,12s
		Waffle (Pique) Cloths (dobby-woven)		
38	4.33	70x70	31s	30s
39	4.90	108x84	40s	38s
40	3.20	128x112	40s	45s
40	3.35	108x84	31.50s	43s
”	”	”	34.50s	39s
		Moleskins (filling sateens, mostly 8-harness)		
32	1.65	60x116	14s	12s
34	1.68	60x116	13s	14s
34½	2.00	68x112	14s	18s
40	1.28	70x120	13s	13s
40	1.62	60x98	13s	14s
24	1.59	44x240	20/2	16s
30	1.17	67x284	29/2	18s
30	1.25	53x170	20/2	11s
33	.68	38x400	24/3	14s
		Corduroys		
24	.893	39x510	18/2	18s
24	1.00	40x432	16/2	18s
24	1.21	37x420	20/2	18s
24	1.83	34x270	16/2	22s
24	2.94	87x368	60/2	50s

B	Y	E x P	W	F
		Corduroys (Continued)		
25	2.909	30x344	60/2	40s
25½	2.623	55x318	38/2	34s
28½	1.17	36x276	32/3	14s
28½	1.34	42x354	18/2	23s
28½	1.50	96x240	45s	16s
28½	1.75	48x288	36/2	22s
28½	2.286	55x318	38/2	34s
30	1.52	56x182	21/2	15½s
31	1.495	75x466	38/2	40s
31	2.12	67x190	16s	24s
31	2.286	60x167	30/2	24s
32	1.65	52x264	22/2	28s
32½	1.28	38x350	36/3	21½s
32½	1.73	55x232	22/2	26½s
32½	1.98	68x190	36/2	24s
32½	2.06	46x195	26/2	21s
33	1.28	56x238	30/2	16s
33	1.391	55x256	30/2	19s
33	1.416	48x188	20/2	16s
33	1.455	55x203	30/2	16s
33	1.524	54x194	30/2	16s
33	1.538	72x196	20s	16s
33	1.553	54x190	30/2	16s
33	1.60	55x185	20s	16s
33	1.72	54x169	17s	16s
33	2.00	55x318	38/2	34s
33	2.00	67x190	16s	24s
33	2.192	48x132	17s	16s
33½	1.60	58x203	28/2	20s
33½	1.73	54x140	22/2	16s
33½	1.80	55x142	22/2	18s
34	1.34	47x342	28/3	28s
37½	1.97	45x102	16s	13s
37½	2.31	65x190	26s	32s
37¾	1.74	50x112	17s	12s
38	1.42	48x90	15s	8s
39	1.87	52x112	18s	14½s
39	1.89	45x102	16s	13s
39	1.90	76x140	25s	20s
39½	1.35	45x90	15¼s	8s
39½	1.41	45x100	15s	9s
39½	1.75	45x116	15s	14s
40	1.37	44x120	16s	10¼s

B	Y	E x P	W	F
		Corduroys (Continued)		
40	1.41	46x116	16s	11¼s
40	1.84	46x116	16s	15s
40	1.88	44x120	16s	16s
42	2.29	57x178	22s	32s
42	2.30	58x184	23s	33s
42	2.43	56x180	48/2	34s
		Plain-back Velveteens (in the gray)		
22½	4.85	66x184	29s	36s
23½	4.68	64x176	26s	38s
30½	2.75	65x208	26s	30s
31½	2.80	65x208	28s	32s
31½	2.96	63x204	28s	33s
37½	2.22	65x208	26s	30s
37½	2.57	67x184	30s	36s
37½	3.91	74x248	60s	60s
37¾	2.30	67x218	30s	32s
38	2.33	67x204	30s	31s
38	2.50	67x184	30s	36s
38½	2.89	64x176	26s	38s
39½	2.37	63x216	28s	35s
39½	2.74	64x190	28s	38s
40	2.22	68x210	26s	30s
		Twill-back Velveteens (in the gray)		
22½	3.46	72x256	36s	32s
23	3.43	72x285	36s	26s
23½	3.27	74x255	65/2	32s
24	2.80	84x520	70/2	60s
24	3.12	81x300	60/2	40s
24	3.12	88x540	80/2	70s
24	3.23	83x440	70/2	60s
24	3.75	84x432	80/2	70s
27	3.04	84x360	38s	50s
30	2.20	88x460	80/2	50s
30	2.40	92x420	36s	50s
30	3.07	77x268	54s	40s
36	1.75	72x500	80/2	50s
37½	1.97	101x560	80/2	70s
37½	2.02	72x268	36s	32s
37½	2.11	72x256	36s	32s
37½	2.14	74x350	36s	45s
37½	2.54	82x435	80/2	70s

B	Y	E x P	W	F
Twill-back Velveteens (in the gray) (Continued)				
38½	2.13	76x336	60/2	48s
38½	2.14	75x320	65/2	45s
38½	2.21	76x348	78/2	48s
38½	2.36	76x320	80/2	48s
38½	2.48	76x300	80/2	48s
39	2.11	75x320	62/2	45s
40	2.14	75x403	70/2	58s

Size of bedspread, inches.	Weight of bedspread, pounds.	E x P	W	F
Crochet Bedspreads				
71 by 89	2.10	36x28	13/2	7s
71 by 80	2.27	36x28	9/2	7s
72 by 84	2.61	30x28	9/2	13/3
76 by 88	2.95	32x27	15/3	12/3
72 by 88	3.17	36x28	9/2	9/2
76 by 88	3.50	35x32	15/3	12/3
75 by 90	3.50	37x35	15/3	15/3
78 by 90	3.72	37x35	15/3	15/3
Marseilles Bedspreads				
72 by 86	3.14	66x84	20s,15s	14s,4.25s
75 by 87	3.66	62x88	20s,15s	15s,3s
76 by 88	3.66	63x88	25s,19s	11s,6s
80 by 89	4.51	92x112	30s,15s	26s,3s
80 by 90	4.87	88x111	25s,19s	24s,2.80s
80 by 90	5.05	105x145	25s,19s	34s,4.12s
Satin Bedspreads				
76 by 88	3.00	60x48	25s,10s	24s,4.12s
80 by 90	3.40	90x120	80/2,30/2	65s,11s
76 by 88	3.50	60x54	25s,10s	24s,3.50s
79 by 90	3.78	88x104	40s,27s	60s,4.50s
78 by 90	4.02	60x60	25s,10s	24s,3.50s
80 by 90	4.03	75x94	80/2,10s	45s,6s
80 by 90	4.14	60x70	80/2,10s	45s,3.50s
80 by 90	4.21	73x80	40s,20s	50s,3.40s
80 by 90	4.39	90x120	80/2,30/2	65s,6s

Section E—DUCK FABRICS

	B	Z	E x P	W	F	Z′
			Heavy Naught Ducks			
			(Oil press cloths, paper-felt dryer canvas, etc.)			
Special	22	32	20x12	7/14	7/14	52.36
No. 12/0	22	30	20x13	7/13	7/13	49.09
No. 11/0	22	29	19x13	7/13	7/13	47.45
No. 10/0	22	28	19x13	7/13	4/6	48.52
	22	28	26x13	7/8	7/15	48.52
No. 9/0	22	27	26x11½	7/8	7/15	44.18
No. 8/0	22	26	25x14	7/8	7/12	42.55
	22	26	26x12	7/7	7/15	42.55
No. 7/0	22	25	26x12½	7/7	7/14	40.91
	22	25	27x14	7/7	7/12	40.91
No. 6/0	22	24	19x16	7/9	7/11	39.27
	22	24	26x13	7/7	7/12	39.27
	22	24	27x14	7/7	7/11	39.27
No. 5/0	22	23	26x13½	7/7	7/11	37.64
No. 4/0	22	22	26x16	7/7	7/8	36
No. 3/0	22	21	26x17	7/7	7/7	34.36
			Sail Ducks (hard texture)			
No. 2/0	22	20	26x18	7/6	7/7	32.73
No. 1/0	22	19	26x19	7/6	7/6	31.09
No. 1	22	18	26x20	7/6	7/5	29.45
	22	18	27x19½	7/5	7/6	29.45
No. 2	22	17	27x21	7/5	7/5	27.82
No. 3	22	16	29x22	7/4	7/5	26.18
No. 4	22	15	29x24	7/4	7/4	24.55
	22	15	31x23	7/4	7/4	24.55
No. 5	22	14	36x24	7/3	7/4	22.91
No. 6	22	13	36x26	7/3	7/3	21.27
No. 7	22	12	35x22	7/3	7/3	19.63
	22	12	36x25	7/3	13/5	19.63
No. 8	22	11	33x23	7/3	8/3	18
	22	11	33x28	7/3	13/4	18
	22	11	38x33	10/4	13/3	18
	22	11	46x28	10/3	12¼/4	18
	22	11	46x29	14/3	14/6	18

	B	Z	E x P	W	F	Z′
			Sail Ducks (hard texture) (Continued)			
No. 9	22	10	38x25	8/3	12/3	16.36
	22	10	40x33	13/4	12/3	16.36
	22	10	44x30	13/3	12/4	16.36
	22	10	46x32	13/3	13/4	16.36
No. 10	22	9	44x26	10/3	14/3	14.73
	22	9	46x30	14/3	14/4	14.73
	22	9	46x34	13/3	13/3	14.73
	22	9	48x30	13/3	12/3	14.73
	22	9	49x30	12½/3	13/3	14.73
No. 11	22	8	44x32	12/3	12/2	13.08
	22	8	46x36	13/3	13/2	13.08
No. 12	22	7	40x34	13/3	13/2	11.45
	22	7	48x34	10/2	14/2	11.45
	22	7	49½x30	13/2	13/3	11.45
	22	7	52x36	12/2	12/2	11.45
			Sail Ducks (medium texture)			
No. 2/0	22	20	26x16	6/5	7/8	32.73
No. 1/0	22	19	26x17	6/5	7/7	31.09
No. 1	22	18	26x17	6/5	7/6	29.45
No. 2	22	17	26x18	6/5	7/5	27.82
	22	17	29x17	7/5	7/6	27.82
No. 3	22	16	28x19	6/4	7/5	26.18
No. 4	22	15	28x20	6/4	7/4	24.55
	22	15	29x20	7/4	7/5	24.55
No. 5	22	14	29x21	7/4	7/4	22.91
	22	14	34x20	6/3	7/4	22.91
No. 6	22	13	34x22	6/3	7/3	21.27
			Wide Number Ducks (harvester ducks, etc.)			
Wide No. 2	36	27.82	29x22	7/5	7/5	27.82
Wide No. 4	36	24.55	31x23	7/4	7/4	24.55
Wide No. 6	36	21.27	36x26	7/3	7/3	21.27
	41½	24.52	36x26	7/3	7/3	21.27
	44	26	36x26	7/3	7/3	21.27
	60	35.46	36x26	7/3	7/3	21.27
	72	42.54	35½x26	14/6	14/6	21.27
Wide No. 7	36	19.63	36x25	7/3	13/5	19.63
	37½	20.45	36x25	7/3	13/5	19.63
	44	24	36x25	7/3	13/5	19.63
	46	25.08	36x25	7/3	13/5	19.63
	47	25.63	36x25	7/3	13/5	19.63

	B	Z	E x P	W	F	Z′
Wide Number Ducks (harvester ducks, etc.) (Continued)						
Wide No. 8	36	18	33x28	7/3	13/4	18
	36	18	38x33	10/4	13/3	18
	36	18	44x28	10¼/3	11¼/4	18
	36	18	46x28	10/3	12¼/4	18
	36	18	47x28	14/3	14/6	18
	44	22	33x28	7/3	14/4	18
	47	23.50	38x33	10/4	13/3	18
	48	24	38x33	10/4	13/3	18
Wide No. 9	36	16.36	40x33	13/4	12/3	16.36
	37½	17.04	42x31	7/2	12/3	16.36
	44	20	40x33	13/4	12/3	16.36
	48	21.80	40x33	13/4	12/3	16.36
	49½	22.50	40x33	13/4	12/3	16.36
	51	23.18	40x33	13/4	12/3	16.36
	53	24.09	40x33	13/4	12/3	16.36
Wide No. 10	36	14.73	46x30	14/3	14/4	14.73
	36	14.73	48x30	13/3	12/3	14.73
	36	14.73	49x30	12½/3	13/3	14.73
	44	18	46x30	14/3	14/4	14.73
	50	20.45	44x30	12.3/3	11½/3	14.73
	50	20.45	46x30	14/3	14/4	14.73
	50	20.45	46x34	13/3	13/3	14.73
	72	29.45	46x34	13/3	13/3	14.73
	72	29.45	48x30	13/3	12/3	14.73

B	Z	E x P	W	F	Z′
Army Ducks					
28½	15	46x32	13/4	13/4	18.95
28½	12	46x34	13/3	12/3	15.16
28½	12	50x34	13/3	13/3	15.16
28½	10	46x37	13/3	14/2	12.63
28½	10	55x37	12/2	16/3	12.63
28½	9	51x37	12/2	13/2	11.37
28½	9	55x38	13/2	13/2	11.37
28½	8	48x40	13½/2	14½/2	10.10
28½	8	50.14x39	14/2	14/2	10.10
28½	8	52½x42	14/2	16/2	10.10
28½	8	54x42	14/2	16/2	10.10
28½	8	55x40	14/2	16/2	10.10
28½	7	52x41	16/2	18/2	8.84
30	12.90	46½x35	13/3	12/3	15.48
30	12	40x32	12/3	12/3	14.40

B	Z	E x P	W	F	Z′
		Army Ducks (Continued)			
30	10.53	46x37	13/3	14/2	12.64
30	10.53	46½x36	13½/3	13½/2	12.64
30	10.53	54x36	14/2	13/3	12.64
30	8.42	52x40	14/2	15/2	10.10
30	8.42	54x42	14/2	16/2	10.10
30¼	13.70	46x34	12/3	11/3	16.30
30¼	12.90	46x34½	13/3	12/3	15.35
30¼	12.40	46x32	22/5	20/5	14.76
30¼	12.40	47¼x30	13/3	16/4	14.76
30½	13.68	46½x34	12/3	12/3	16.15
30½	10.75	46x38	13/3	14/2	12.68
31	8.70	54x42	14/2	16/2	10.12
32	8.64	60x42	14½/2	20/2	9.76
35	8.25	62x60	22/2	22/2	8.48
35½	8.37	60x60	22/2	22/2	8.49
36	10.10	54x42	14/2	16/2	10.10
36	8.42	60x60	22/2	22/2	8.42
37	13	46x37	13/3	14/2	12.65
60½	24.80	47¼x30	13/3	16/4	14.76
		Bag Ducks (for mail bags, etc.)			
16½	8.25	36½x22½	7/3	13/4	18
21	5.89	48x40	13½/2	14½/2	10.10
22	11	36½x22½	7/3	13/4	18
23	14.63	29x21	7/4	7/4	22.90
25	12.50	36½x22½	7/3	13/4	18
29	8.14	52x43	15/2	15/2	10.10
30	8.42	53x37	14/2	14/2	10.10
32	16	36½x22½	7/3	13/4	18
33	9.26	52x43	15/2	15/2	10.10
36	18	36½x22½	7/3	13/4	18
		Belt Ducks			
24	20	29x18	7/6	7/5	30
42	36	23x12	6/7	7/7	30.86
42	34	23x12	6/7	7/6	29.14
42	32	23x14	7/8	7/5	27.43
42	32	24x13	7/7	7/6	27.43
42	30	25x15	7/6	8/6	25.71
42	30	26x15	7/5	7/7	25.71
42	28	26x14½	7/5	7/6	24
42	26	24x16	7/5	7/5	22.28
42	24	26x14	7/5	7/4	20.57

B	Z	E x P	W	F	Z′
		Hose Ducks			
40	22	29.6x21	13/5	13/9	19.80
40	16	26x16½	7/3	7/3	14.40
40	14	28x19	9/3	8/3	12.60
40	12	30x21	12/3	7/2	10.80
40	10	28x21	14/3	7/2	9.00
40	8	26.6x20	10/2	10/2	7.20
42	20	26x16	7/3	7/5	17.14
46	13.80	28x25	8/2	7/2	10.80
		Boot Ducks			
39	11	28x22	8/2	8/2	10.15
40	8	28x17	10/2	10/2	7.20
40	11	28x15	7/2	7/2	9.90
		Shoe Ducks			
37	8	50x36	14/2	23½/2	7.78
37	8	50x36	16/2	18/2	7.78
37	8	52x36	16/2	20/2	7.78
37	8	55x42	16/2	25/2	7.78
37	7.50	52x36	18/2	20/2	7.30
37	7	52x36	18/2	22/2	6.81
37½	8	49x40	15½/2	21/2	7.68
37½	7.50	49x36	17½/2	20/2	7.20
50	20.45	46x34	13/3	13/3	14.72
50	13.80	47x36	13/2	13/2	9.94
B	Z	E x P	W	F	Y
		Mattress Ducks (single filling)			
38	8.75	54x34	14/2	11s	1.83
38	5.67	54x40	18/2	16s	2.82
		Enameling Ducks (taped warp; double filling)			
29	10	88x31	10s	16/3	1.60
29	10	88x32	10s	15/3	1.60
29	8	88x32	13s	12/2	2.00
29	8	88½x32	14s	9½/2	2.00
29	8	89x32	12s	13½/2	2.00
30	9	93x48	14s	14/2	1.78
38	9	84x28	13s	13/2	1.78
38	8.89	82x27	12.25s	14/2	1.80
38	8	83x24	14s	13/2	2.00
38	8	84x30	16s	14/2	2.00
38	8	88½x27	14s	15/2	2.00

B	Z	E x P	W	F	Y
Enameling Ducks (taped warp; double filling) (Continued)					
46½	10.88	82x27	12.25s	14/2	1.47
51½	11.85	82x30	14s	12/2	1.35
51½	11.85	84x28	13.50s	13½/2	1.35
51½	10	84x28	17s	14/2	1.60
72	16.84	82x27	12.25s	14/2	0.95
Flat Ducks (taped warp; single filling)					
27	6.25	72x32	12.25s	7.75s	2.56
27½	5.50	76x30	13.50s	8.50s	2.91
28½	8	72x32	12.25s	5.25s	2.00
29	10	72x28	8s	4s	1.60
29	10	76x28	8s	4.50s	1.60
29	10	84x29	10s	4.25s	1.60
29	10	88x28	10s	4.40s	1.60
29	9	76x28	8s	6s	1.78
29	8	72x27	10s	5.50s	2.00
29	8	72x28	8s	7s	2.00
29	8	76x28	9.50s	6s	2.00
29	8	76x30	9s	9s	2.00
29	8	84x28	10s	7.25s	2.00
29	8	88x28	13s	5.40s	2.00
29	7	76x28	9.50s	9.50s	2.28
29	6	72x24	12.25s	7.75s	2.67
29	6	76x30	13.50s	8s	2.67
29½	10	78x27	7.50s	5.20s	1.60
29½	9	78x27	7.50s	7.50s	1.78
29½	8	72x27	9.50s	5.20s	2.00
29½	8	78x27	8.50s	8s	2.00
29½	8	78x29	10.50s	6.25s	2.00
30	10	82x36	10s	5s	1.60
30	9	74x29	9.50s	5s	1.78
30	9	82x34	12s	5s	1.78
30	8.25	74x28	10s	5s	1.94
30	8.25	93x44	14s	8s	1.94
30	8	88x32	10.50s	7.75s	2.00
30	8	88½x31	13s	5.90s	2.00
30	8	104x38	13s	9s	2.00
30	7.50	75x20	10s	5s	2.13
30	7	72x32	12.25s	7.75s	2.28
30	7	83x30	12s	7.60s	2.28
30	6	76x30	13.50s	8.50s	2.67
30¼	9	78x30	11s	4.75s	1.78
30½	7.14	76x30	13.50s	6s	2.24

B	Z	E x P	W	F	Y
Flat Ducks (taped warp; single filling) (Continued)					
31	6.70	76x30	13.50s	7s	2.39
31	6.25	76x23	13.50s	6s	2.56
31	6.25	76x30	13.50s	8.50s	2.56
31	5.75	76x30	13.50s	10.50s	2.78
36	10	88x32	10.50s	7.25s	1.60
38	9.20	84x27	12.25s	6.75s	1.74
38	9	84x28	13s	6.50s	1.78
40	11.25	88x32	10.50s	7.25s	1.42
40	6.15	72x24	13.60s	11s	2.60
46	13.80	82x34	12s	5s	1.16
51½	11.85	82x30	13.50s	6.50s	1.35
52	10.13	96x36	22s	8s	1.58
72	16	80x30	13s	7.50s	1.00
72	15.24	84x28	14s	8s	1.05
Waste Ducks (taped warp; single filling)					
30½	9	76x27	14s	3s	1.78
36	12	72x26	10s	3s	1.33
37¼	10	59x24	12.50s	3.20s	1.60
39	8.75	46x22	12.50s	3.20s	1.83
39	8.37	60x24	22.50s	3.20s	1.91

Section F—TIRE FABRICS

B	Z	E x P	W	F	Z′
		Cord Fabrics (plainwoven)			
48	20	26½x2½	23/5/3	23s	15
48	19.07	25x3	21¼/5/3	30s	14.30
48	15.20	20x4	11.2/4/2	30s	11.40
48	13.80	18x2	21¼/5/3	30s	10.35
54	22.50	26½x2½	23/5/3	23s	15
56	22.94	24x2	21¼/5/3	30s	14.75
56	22.63	25x2	21¼/5/3	30s	14.55
56	13.14	14x5	21¼/5/3	30s	8.45
57	23.75	26x2½	23/5/3	18s	15
58	24.38	26x2	21¼/5/3	30s	15.13
58	18.77	20x4	21¼/5/3	30s	11.65
58	18.37	20x4	11.2/4/2	30s	11.40
60	27.92	20x5	24/8/3	24s	16.75
60	25.50	26x3	22/5/3	22s	15.30
60	25	26½x2½	23/5/3	23s	15
60	23.25	26x2¾	23/5/3	20s	13.95
60	20	27x3	22/4/3	22s	12
		Builder Fabrics (plainwoven)			
48	23.33	22½x22	20/10	20/10	17.50
48	23	23x23	23/11	23/11	17.25
54	25.87	23x23	23/11	23/11	17.25
58	27.79	22.9x22.7	23/11	23/11	17.25
59	37.70	18x18	20/15	20/15	23
60	30	24x24	23/11	23/11	18
60	28.75	21x21½	23/12	23/12	17.25
60	28.75	23x23	23/11	23/11	17.25
60	27.50	21½x22½	25/12	25/12	16.50
60	25.83	21½x22½	24/11	24/11	15.50
72	34.50	23x23	23/11	23/11	17.25
84	40.25	23x23	23/11	23/11	17.25
90	43.12	23x23	23/11	23/11	17.25
		Chafer Fabrics (plainwoven)			
48	12	35x33	23/4	23/4	9
48	10.8	37x39	14/2	14/2	8.10
54	18	22½x23½	20/4	20/4	12

B	Z	E x P	W	F	Z′
		Chafer Fabrics (plainwoven) (Continued)			
54	13.50	35x33	23/4	23/4	9
60	23.84	22½x23½	10/4	10/4	14.3
60	23.84	22½x23½	20/8	20/8	14.3
60	20	22½x23½	20/4	20/4	12
60	20	35x37	23/5	23/5	12
60	19.17	29½x30	24/6	24/6	11.50
60	15.42	29x31	10/2	10/2	9.25
60	15.42	29x31	20/4	20/4	9.25
60	15	35x33	23/4	23/4	9
60	14	34x36	12/2	14/2	8.40
60	13.50	35x37	20/3	20/3	8.10
60	13.50	37x39	14/2	14/2	8.10
		Breaker Fabrics (plainwoven)			
48	15.33	13x12	20/12	20/12	11.50
48	15.33	13x13	21/12	21/12	11.50
48	12.27	10x10	20/12	20/12	9.20
60	31.83	16x16	23/5/3	23/5/3	19.10
60	19.17	12x13	20/12	20/12	11.50
60	15.33	10x10	20/12	20/12	9.20
60	13.07	12x13	20/8	20/8	7.84
		Breaker Fabrics (mock-leno weave)			
48	18	13.66x14	20/12	20/12	13.50
60	12.92	11½x11½	20/8	20/8	7.75
		Breaker Fabrics (leno-woven)			
48	10.93	13.57x8	20/7,20/7	20/12	8.20
60	26.67	15x7	20/4/3,20/4/3	20/6/4	16.00
60	19.17	24x8	25/6,25/12	25/18	11.50
60	15.83	24x8	25/6,25/12	25/12	9.50
60	12.50	24x9	25/4,25/8	25/12	7.50

PART 2

COTTON CLOTHS WOVEN IN WHOLE OR IN PART OF DYED YARNS

B	Y	E x P	W	F
		Denims (3-leaf warp twills)		
		(Dyed warp: white, mock-twist, or dyed filling)		
28	1.78	67x46	7s	11s
28	2.00	61x40	7s	10s
28	2.00	66x40	7s	11s
28	2.00	67x40	7.75s	10s
28	2.00	70x40	9.25s	9.50s
28	2.00	72x42	7.75s	12s
28	2.00	76x35	8s	9.50s
28	2.00	76x40	9.25s	9.50s
28	2.00	76x44	8.25s	12s
28	2.20	64x38	7.75s	10s
28	2.20	67x46	8s	14s
28	2.20	68x40	8.25s	14s
28	2.20	68x44	8s	15s
28	2.20	69x38	8.25s	14.50s
28	2.20	69x44	8s	16s
28	2.20	70x40	9.25s	11.50s
28	2.20	72x40	8.70s	12s
28	2.20	73x38	9.50s	10.50s
28	2.40	62x38	8.70s	12s
28	2.40	62x38	8.75s	10.75s
28	2.40	64x38	8.75s	11.75s
28	2.40	66x40	9s	12s
28	2.40	69x42	9s	15.50s
28	2.40	70x40	9.70s	11s
28	2.40	75x44	10s	14s
28	2.45	68x42	9.25s	16s
28	2.45	70x40	9.25s	17.50s
28	2.45	74x41	10.50s	11s
28	2.45	76x38	10.50s	12.50s
28	2.47	76x40	11s	10s
28	2.50	68x44	10s	15s
28	2.60	63x36	8.70s	15s

B	Y	E x P	W	F
		Denims (Continued)		
28	2.60	68x38	11.50s	10.75s
28	2.60	75x40	11s	15s
28	2.80	62x34	8.70s	16s
28	2.80	66x38	11.25s	12s
28	2.95	71x38	12.50s	13s
28	3.20	66x38	12s	13.50s
28¼	2.16	63x44	7.65s	14.56s
28¼	2.36	72x40	10.15s	11s
28¼	2.46	63x44	8.50s	16.25s
28¼	2.52	72x40	10.15s	14.75s
28½	1.60	68x48	7s	9s
28½	1.78	68x48	7s	11s
28½	1.91	72x46	9s	11s
28½	1.92	70x46	9s	10.60s
28½	1.99	63x44	7.30s	12.20s
28½	2.00	63x48	7s	13s
28½	2.10	68x46	9s	13.50s
28½	2.10	72x46	9s	14s
28½	2.15	63x44	7.65s	14.56s
28½	2.20	66x44	8s	15s
28½	2.23	66½x40	9s	12.50s
28½	2.34	66½x42	9s	16.50s
28½	2.39	66x40	8s	15s
28½	2.40	67x40	8.60s	14.50s
28½	2.44	63x44	8.50s	16.25s
28½	2.50	67x44	9s	15.50s
28½	2.67	63x44	9.40s	17.93s
28½	2.80	65x44	9s	19.50s
28½	2.98	63x38	10.50s	12.20s
28½	3.00	67x44	10.50s	19.50s
28½	3.25	63x38	11.10s	20.60s
28½	3.25	64x40	10.50s	22s
28½	3.49	63x38	11.80s	23.20s
29	2.00	68x44	8.60s	10.50s
29	2.20	60x46	9s	11s
29	2.20	68x44	8.60s	13.25s
29	2.20	68x44	9s	14s
29	2.45	65x40	9s	17s
29	2.45	67x40	9.60s	12.50s
29	3.00	62x34	10s	17s
29¼	3.00	70x40	12.60s	15.25s
29¼	3.50	66x36	12.60s	17.25s
30	2.15	67x44	8.90s	13s

B	Y	E x P	W	F
		Denims (Continued)		
30	2.20	65x42	8.25s	13.75s
30	2.35	63x40	8.90s	13s
30	2.41	63x44	8.90s	16s
30	2.95	72x40	12.50s	16s
30	3.40	62x36	12.50s	16s
		Denim Stripes, incl. Hickory, Express, etc. (3-leaf warp twills) (Striped warp; white filling)		
26	3.00	58x38	10.50s	9.70s
26½	3.00	58x38	9s	13s
27	3.20	71x50	12s	18.50s
27½	3.75	66x42	14s	16.25s
28	2.50	66x37	10s	10s
28	2.50	76x40	10.50s	12.50s
28	3.10	74x48	12s	19.80s
28	3.50	60x40	13s	14s
28½	2.01	58x52	9s	9.75s
28½	2.11	67x46	9s	13.50s
28½	2.20	68x45	9.60s	13.70s
28½	2.85	72x42	12.50s	12.50s
28½	3.14	67x48	12s	17s
30	2.75	76x39	12s	14s
30	2.98	72x40	12.50s	16s
30	3.00	80x41	16s	12s
30	3.10	66x40	12s	16s
30½	2.01	66x46	8.90s	11s
30½	2.15	66x44	8.90s	13s
30½	2.37	66x42	8.90s	16s
36½	2.50	72x42	13s	17s
37½	2.60	68x40	13.75s	15s
37½	2.65	68x40	13.75s	16s
37½	2.80	68x40	13.75s	18s
		Beach Stripes (3-leaf warp twills) (Striped warp; white filling)		
36	2.88	66x42	14s	18s
39	2.79	63x42	13.75s	18s
		Coverts (3-leaf warp twills) (Mock-twist warp; dyed filling)		
28	2.24	67½x26	12.50s	3.75s
28	2.40	68x42	9.25s	13.50s
28¼	2.95	69x40	12.50s	13s

B	Y	E x P	W	F
		Coverts (3-leaf warp twills) (Continued)		
28½	3.50	58½x34	12.50s	13s
29	2.40	68x40	12s	8s
36	2.00	72x42	11.25s	12s
		Cotton Suitings (plainwoven or twilled) (Including cottonades, cotton cassimeres, cotton tweeds, etc.)		
26	3.31	63½x40	12.50s	11s
26	3.75	54x48	13.50s	13.50s
28	1.60	58x40	7s	5.50s
26	1.78	72x48	10s	7s
28	2.00	60x40	7s	10s
28	2.00	64x34	12.50s	4.50s
28	2.00	66x36	7s	11s
28	2.16	42x40	7s	7s
28	2.25	42x34	12.50s	3.75s
28	2.27	48x38	12s	5s
28	2.27	64x28	8s	8s
28	2.28	58x38	10s	7s
28	2.50	106x70	20s	14s
28	2.73	70x29	12s	8s
28	2.88	70x40	12.50s	12.50s
28	2.96	68x29	12s	10s
28	3.00	58x39	12s	10s
28	3.00	61x38	12s	10s
28	3.00	68x40	12.50s	12.50s
28	3.02	76x40	13.70s	13.70s
28	3.10	62x40	12.50s	11s
28	3.13	65½x40	12.50s	13s
28½	2.00	43x38	7s	5.50s
28½	2.28	35x32	7s	5.75s
29	1.78	44x40	6s	6s
29	1.78	66x42	10s	6s
29	2.00	70x44	12s	7s
29	2.27	70x40	12s	8s
29	2.40	70x36	12s	8s
30	3.26	52x46	13.32s	13.32s
		Cotton Ply-yarn Suitings (plainwoven or twilled)		
28	2.07	50x48	18½/2	14/2
30	2.00	101x42	24/2	20/2
30	2.00	106x52	26/2	30/2
50	2.00	60x60	38/2	14s

B	Y	E x P	W	F
		Outing Flannels (plainwoven; napped)		
		(White or white and dyed warp and filling)		
27	4.25	48x40	20s	10s
27	4.45	56x50	26s	12.50s
27	4.50	48x50	30s	11s
27	4.70	46x35	20s	10s
27	4.80	44x44	20s	12s
27	5.00	44x40	20s	12s
28	4.06	47x50	26s	10s
28	4.15	48x48	22s	11s
28	4.30	47x46	26s	10s
28	4.90	48x42	22s	12s
28	5.00	44x44	20s	14s
28	5.10	40x40	20s	12s
30	4.15	55x52	21.50s	14.50s
36	2.20	48x44	13.60s	7s
36	2.75	66x56	24s	12s
36	3.00	59x48	21.50s	11.80s
36	3.45	54x52	21.50s	14.50s
36	3.75	40x40	24s	10s
36	3.85	54x48	25s	15.50s
40	2.30	48x44	13.60s	10s
40	4.00	48x40	21.50s	15s
40	4.02	42x44	26.50s	13.75s
		Pin Checks (plainwoven, with taped warp)		
		(Striped warp; dyed filling)		
26	2.58	76x40	11.30s	11.50s
26	4.50	76x38	17.25s	19.75s
28	2.75	76x38	12s	12s
29	2.50	76x40	12.10s	12.10s
30	2.75	76x38	14.70s	11.30s
30	2.90	76x40	14.70s	14.70s
30	3.36	76x40	16.75s	16.75s
		Cheviot Shirtings (plainwoven)		
		(Striped warp; dyed filling)		
23	5.20	81x36	19s	16.30s
24	4.00	72x46	13s	22s
26	4.60	81x36	19s	16.30s
26½	5.21	70x46	19s	23.75s
27	3.45	72x40	14s	14s
27	4.50	52x48	16s	16s
28	4.00	62x52	16s	20s

B	Y	E x P	W	F
		Cheviot Shirtings (plainwoven) (Continued)		
28	4.34	52x48	16s	16s
28	5.00	70x46	19s	23.75s
30	4.75	58x56	22s	22s
32	4.50	70x46	19s	25.35s
32	5.05	70x44	22s	25.35s
		Work-shirt Chambrays (plainwoven) (One-color warp; white filling)		
36	3.20	67½x58	17.50s	20s
36	3.50	67½x46	17.50s	20s
36	3.60	68x50	18s	25s
36	3.90	67½x44	17.50s	25.50s
36	3.90	68x48	20s	26s
36	4.48	71x42	22s	25.50s
37½	3.05	68x60	18s	25s
37½	3.65	68x50	21s	25s
		Romper Cloths (plainwoven in chambrays, checks and plaids)		
28	5.15	76x52	22s	30s
28	5.50	72x72	30s	30s
32	3.75	76x56	18s	30s
32	4.50	70x44	20s	26s
32	4.50	76x52	22s	30s
32	4.75	92x48	28s	30s
32	4.80	72x72	30s	30s
		Coarse Plaids (plainwoven on box looms)		
24	6.27	40x32	14.50s	14.50s
25	4.89	44x36	13s	13s
25	5.00	44x38	13s	14s
25	5.75	40x38	14.50s	15s
25	6.00	38x34	14s	14s
25½	4.95	44x38	13.50s	13.50s
26	4.65	52x48	16s	16s
26	4.90	46x36	14s	14s
27	3.95	52x36	13s	13s
27	3.97	48x49	13.50s	14.50s
27	4.19	48x42	13.50s	13.50s
27	4.35	40x48	14s	14s
27	4.53	44x40	13.50s	13.50s
27	4.57	46x39	14s	14s
27	4.75	48x40	15s	15s
27½	4.29	52x48	16s	16s

B	Y	E x P	W	F
	Coarse Plaids (plainwoven on box looms) (Continued)			
28	4.00	40x40	12s	12s
30	3.57	52x48	14s	14s
	Coarse Ginghams (plainwoven on box looms)			
26	5.60	60x56	20s	26s
26	6.23	68x48	22s	30s
26	6.75	48x44	22s	22s
26	7.00	56x48	25s	25s
26	7.10	48x44	20s	27s
26	7.30	62x48	26s	30s
26	7.65	52x44	25s	26s
26	7.65	54x46	26s	26s
26	8.00	48x44	25s	26s
26¼	6.60	63x54	26s	30s
26½	6.50	56x50	25s	25s
26½	6.50	68x52	25s	30s
26½	6.80	56x52	26s	26s
27	6.37	54x52	25s	25s
27	6.50	54x52	25s	26s
27	6.50	60x56	25s	30s
27	6.50	68x52	26s	30s
28	4.92	68x48	18s	30s
28	6.00	64x48	22s	30s
31½	5.25	68x48	22s	30s
32	5.02	64x52	25s	25s
32	5.25	55x48	20s	27s
32	5.40	64x54	26s	30s
32	5.50	48x44	22s	22s
32	5.50	54x50	20s	30s
32	5.50	64x52	25s	30s
32	5.75	62x48	25s	30s
32	5.85	62x50	26s	30s
36	5.15	48x44	20s	27s
	Ginghams (plainwoven on box looms)			
26	6.15	72x64	30s	30s
26	6.40	76x64	31s	33s
26	7.20	64x50	25s	35s
26	7.90	62x54	26s	34s
26½	6.74	76x62	30s	40s
26½	6.80	66x52	27s	30s
26½	7.00	70x54	28s	37s
26½	7.14	72x64	30s	40s

B	Y	E x P	W	F
	Ginghams (plainwoven on box looms) (Continued)			
27	6.36	67x56	25s	35s
27	6.50	64x56	25s	35s
27	6.68	74x64	35s	35s
27	6.80	64x54	25s	35s
27	7.00	72x60	30s	40s
27	7.21	54x56	25s	35s
28	6.45	65x52	25s	35s
30	5.65	76x64	27s	40s
32	5.13	76x74	30s	40s
32	5.20	76x64	31s	33s
32	5.50	64x56	25s	35s
32	5.60	65x50	25s	33s
32	5.71	66x54	27s	32s
32	5.79	72x56	30s	34s
32	5.85	72x58	31s	33s
32	5.90	72x64	30s	40s
32	5.90	76x52	30s	38s
32	5.95	72x60	30s	40s
32	6.00	76x62	32s	40s
32	6.09	68x62	30s	40s
32	6.12	66x54	27s	40s
32	6.34	72x60	32s	40s
32	6.40	68x52	30s	36s
36½	5.05	71x56	30s	30s
	Fine Ginghams (plainwoven on box looms)			
27	8.13	67x72	40s	40s
31	7.81	80x74	50s	50s
31½	5.88	92x80	40s	50s
31½	6.40	82x76	40s	45s
31½	7.20	84x86	50s	56s
32	5.82	84x78	40s	40s
32	6.28	82x84	40s	50s
32	6.40	88x84	45s	50s
32	6.43	94x92	43s	58s
32	6.78	92x86	43s	58s
32	6.98	86x84	50s	50s
36	6.05	84x76	45s	50s
36	6.22	86x84	50s	50s
36¼	7.87	68x62	50s,30s	50s,30s
36½	5.56	82x76	43s	39s
38	5.43	80x76	50s,40s	50s,40s
38	8.10	61x64	50s,30/3	50s
42	5.13	90x88	50s	50s

B	Y	E x P	W	F
		Fine Shirtings (Jacquard-woven)		
32½	4.55	102x84	40s,20/2	35s
34	4.70	120x120	50s	50s
34	5.11	120x92	50s,40s	50s
34	5.78	101x92	50s,40s	50s
37	4.25	144x80	50s	50s
38	4.62	92x88	50s	35s
38	5.61	120x108	60s	70s
39	5.25	96x92	50s	50s
		Oxford Shirtings (woven with taped warp)		
34	4.20	88x40	30s	18s
35	2.25	136x56	20s	24s
37	3.53	88x44	34.50s	14.50s
38	3.65	88x50	40s	16s
38	4.00	88x42	40s	15s
38	4.10	88x52	40s	19s
39	2.15	124x56	20s	25s
39	3.19	120x60	50s	16s
39	3.21	96x44	40s,40/2	12s
39	3.35	88x44	34.50s	14.50s
39	3.50	88x50	50s	13s
39	3.50	90x50	45s	14s
39	3.70	100x50	30.50s	27s
39	3.90	88x42	40s	15s
40	2.67	124x48	30s	18s
		Seersuckers		
37	3.50	96x68	30s	40s
37	4.45	72x72	30s	40s
37½	3.80	80x80	30s	40s
37½	4.00	76x76	30s	40s
38	3.85	77x84	43s,40/2	39s
38	3.85	81x76	31s	40s
38	4.00	90x72	31s	45s
38	4.02	76x80	50s,20s	50s
38	4.02	76x80	50s,50/2	40s
38	4.17	77x88	43s,40/2	43s
38	4.72	77x100	43s,30s	50s
39½	3.70	74x88	43s,40/2	39s
		Dimity Bedspreads (plainwoven with seersucker stripes)		
72	1.35	66x68	25s,10s	24s
80	1.06	70x58	25s	11s
80	1.19	66x68	25s,10s	24s

B	Y	E x P	W	F
		Straw Tickings (3-leaf twills)		
30	4.10	63x36	14s	24s
30	4.25	73x40	16.50s	24s
30¼	2.53	65x52	10.50s	16s
31	2.94	71x46	12.50s	20s
32	2.57	70x50	14s	13.30s
32	3.12	58x36	12s	14s
36	2.28	70x50	12s	18s
		Tickings (4-leaf twills)		
31	2.61	76x54	14s	16s
31½	2.45	80x50	12.50s	16s
31½	2.60	80x54	12.50s	20s
32	1.96	76x60	12s	12.50s
32	1.98	80x60	12.50s	12s
32	2.00	76x68	12s	14s
32	2.00	80x72	12.50s	15s
32	2.00	88x58	12s	16s
32	2.00	100x72	13s	20s
32	2.03	80x70	12s	16s
32	2.05	78x72	12.50s	16s
32	2.34	82x60	14s	16s
33	2.00	88x60	13s	14.50s
36	1.78	78x62	12s	14s
36	1.86	80x60	12.50s	14s
36	2.00	86x60	13.38s	15.50s
		Sateen Tickings (5-harness)		
32	2.00	96x66	13s	18s
32	2.13	100x52	12.50s	20s
32	3.25	100x44	18.50s	24s
32	3.25	100x64	22s	24s
32	3.37	97x44	18.50s	24s
33	1.90	100x70	13s	18s
33	2.00	100x68	13s	20s
33	2.00	100x72	12.50s	24s
31	1.28	100x52	12.50s	20s
64	1.06	100x52	12.50s	20s
		Nankin Tickings (plainwoven) (Unbleached warp, one-color filling)		
37	2.75	80x80	23s	23s
37	3.45	80x76	23s	30s

B	Y	E x P	W	F
		Awning Stripes (plainwoven)		
		(Striped warp, one-color filling)		
30½	3.55	90x40	16s	25s
31	2.00	99x42	12.50s	12.50s
32	1.53	44x32	12.90/3	12.90/2
32	1.62	63x40	12.90/2	15.30/2
32	1.70	44x32	14.30/3	14.30/2
32	2.00	48x40	13.50/2	10.70s
32	2.21	88x38	12.20s	12.20s
32	2.26	48x34	13.75/2	12.25s
32	2.26	96x40	13.25s	13.25s
		Table Damasks (Jacquard-woven)		
54	1.77	58x72	17s	17s
58	1.90	56x82	20s	20s
58	2.00	61x48	16s	17s
58	2.12	78x76	30s	22s
60	1.68	60x84	20s	20s
63	1.91	61x60	24s	16s
64	1.92	78x76	30s	22s
70	1.45	60x72	18s	18s
72	1.17	63x68	15s	16s
72	1.74	78x76	30s	22s
84	1.24	60x72	18s	18s
90	1.40	72x80	25s	26s
		Upholstery Reps (plainwoven)		
37¾	2.85	108x38	31s	11.50s
50	1.22	88.4x28	30/2	5s
50	1.31	88x31	32/2	5.50s
50	1.388	80x24	30/2	4.50s
50	1.481	68.8x16	32/2	3s
50	1.587	60x15	30/2	3s
50	1.77	128x26	44/2	8/2
		Tapestries (Jacquard-woven)		
49½	.795	151x90	30/2,78/2	6s,8s,40s
49½	.839	141x90	30/2,78/2	6s,8s,40s
49½	1.000	150x69	24/2,78/2	5s,5s,40s
49½	1.036	120x48	20/2,26/2,78/2	5s,6s,40s
49½	1.050	120x50	20/2,24/2,78/2	5s,5s,40s
50	.664	310x66	50/2,80/2	5s,8s,80/2
50	.740	153x100	30/2,80/2	8s,80/2
50	.763	253x84	50/2,80/2	5s,8s,80/2

B	Y	E x P	W	F
		Tapestries (Jacquard-woven) (Continued)		
50	.793	183x84	40/2,100/2	6s,8s,80/2
50	.816	147x112	40/2,80/2	8s,80/2
50	.883	143x72	30/2,78/2	6s,6s,40s
50	.944	138x72	40/2,80/2	5s,6s,40s
50	1.000	138x72	40/2,80/2	5s,24/2,39s
		Cotton Blankets		
36	1.50	40x36	19s	2.90s
36	2.00	56x40	19s	5.50s
46	2.74	41x32	19s	8s
50	1.00	43½x40	22s	3.15s
50	2.35	43x34	19s	8s
54	2.06	42x28	19s	6s
60	1.30	40.1x30	19s	4s
60	1.41	41.6x29	19s	4.50s
60	1.88	39x30	19s	6.50s
64	1.41	40.7x28	19s	4.50s
64	1.61	40x30	19s	6s
64	1.69	40x28	19s	6s
66	1.18	39.4x30	19s	4s
66	1.35	40x36	22s	5.60s
70	1.48	39x32	19s	6s
72	1.10	40x30	19s	4.25s
		Glass Cloths (plainwoven on box looms)		
16½	10.00	60x36	23s,36s*	18s,20s*
17	5.25	56x48	16s,30/2*	16s,12s*
17	5.75	70x48	23s,32/2*	9s,22/2*
				*Dyed yarn.
		Crash Toweling (plainwoven)		
16	5.50	42x34	12s	7s
17	4.00	31x32	7s	5s
17½	5.85	38x38	15s	8s
18	4.40	40x28	16/2	7s
18	4.90	38x30	10s	6.50s
18	5.20	34x34	16s	5.75s
18	6.00	48x38	14s	11s
18	6.50	48x40	20s	10s
18	6.60	38x32	16s	8s
18	6.85	27x36	20s	7.50s
18½	5.85	32x26	10s	6.88s

B	Y	E x P	W	F
		Huckaback Toweling		
15½	6.85	70x30	17s	10s
17	6.30	66x30	16s	10s
17	6.35	79x40	23s	11s
17¾	5.40	84x42	17s	15s
18	4.55	80x40	16s	9s
18¾	5.50	66x30	16s	9s
19	4.40	78x38	15s	10s
19	5.50	78x38	24s	10s
20	4.50	96x30	19s	9s
		Turkish Toweling (terry-woven)		
20	3.25	68x38	16s,16s*	16s,7s
20½	3.60	58x34	16s,20s*	9s
21	2.50	70x40	16s,14s*	12s
21½	2.25	66x36	20/2,20/2*	10s
22	3.34	66x34	16s,20s*	16s
22½	2.40	70x34	16s,14s*	14s
22¾	2.40	78x34	21s,16s*	10s

*Terry pile yarn.

Cotton Rag Rugs ("hit-and-miss" type, plainwoven)

Size of rug, inches*	Weight of rug, ounces**	Warp yarn		Rag filling	
		Total ends	Yarn number	Total picks	Yards per lb.
23 by 33½	16.00	232	8/3	162	124
24 by 33½	16.00	276	8/3	184	153
24 by 34¼	19.04	316	8/3	176	117
24 by 33½	19.20	324	8/3	170	110
24 by 35½	20.11	338	8/3	182	121
24 by 36	21.00	272	8/3	185	110
24 by 35½	21.30	356	8/3	211	140
25 by 47	28.00	304	8/3	242	112
25 by 47	32.00	318	8/3	220	87
24½ by 46	40.00	314	8/3	250	136
27 by 55	30.40	350	8/3	236	98
26½ by 52½	32.00	348	8/3	298	132
27½ by 51½	33.25	328	9/3	237	105
26¼ by 32¾	34.24	308	8/3	297	122
27 by 51½	36.00	348	8/3	232	93
26¾ by 51¾	37.33	346	8/3	268	100
27 by 54	40.00	348	8/3	270	93
28 by 52¾	40.48	290	8/2	257	81

*Actual size of woven rug, not including knotted warp fringe about four inches long at each end.

**Total weight of rug, including fringe.

Note—"Hit-and-miss" rag rugs derive their name from the casual color effect resulting from the rag strips being sewn end to end with but little regard to color. They are woven on either hand or power looms.

TEXTILE FIBERS & YARN NUMBERING

Textile Fibers & Yarn Numbering

Textile fibers may be divided into four main classes, in order of relative importance as follows: Vegetable fibers, man-made fibers, animal fibers, and mineral fibers.

Vegetable fibers include: (a) Seed fibers, mainly cotton; (b) soft or bast fibers, such as flax, hemp, ramie, jute and sunn; (c) hard or leaf fibers, such as abaca (manila), sisal, henequen, istle and cantala (maguey); and (d) fruit fibers, such as coir (coconut fiber). Cotton fibers are extracted by ginning, bast fibers by retting, and leaf fibers by decortication. Cotton and bast-fiber plants are grown from seed; leaf-fiber plants are usually propagated from cuttings.

Man-made fibers include: (a) Rayon, made from cellulose; (b) nylon and other chemical fibers made from non-cellulosic materials; and (c) glass fibers.

Animal fibers include: (a) Wool of the sheep; (b) specialty hairs, such as mohair (hair of the Angora goat), camel hair, alpaca, and vicuna; and (c) silk.

Mineral fibers include asbestos.

There are various other systems of classification of textile fibers. For instance, one based essentially on the chemical nature of the fibers shows: (1) Cellulosic fibers (cotton, rayon, flax, hemp, ramie, jute, sunn, etc.); (2) protein fibers (wool, hair, silk, casein, etc.); (3) thermoplastic polymeric fibers (nylon, Vinyon, etc.); and (4) inorganic or mineral fibers (glass, asbestos, etc.). Another system of classification divides textile fibers into groups according to their primary uses.

Of the world production of textile fibers, cotton probably constitutes about one-half of the total weight and is followed by jute, rayon, wool, hemp, flax, sisal, henequen, abaca, and silk. Other textile fibers are produced in relatively small quantities although there is a steady increase in the output of recently invented man-made fibers.

The United States is the largest producer of cotton, rayon, nylon, and mohair; India of jute and sunn; the Soviet Union of

flax and hemp; British East Africa of sisal; Mexico of henequen and istle; the Philippines of abaca and cantala; New Zealand of phormium; Ceylon of coir; Java of kapok; Australia of wool; China of camel hair and ramie; Peru of alpaca and vicuna; Japan of silk; and Canada of asbestos.

In value per pound the principal textile fibers normally rank on the American market about as follows: Raw silk, nylon, wool, rayon, flax, cotton, rayon staple, hemp, abaca, sisal, jute, henequen, cantala, istle, coir and jute butts.

Cotton, rayon, wool, flax, and silk find their main use in clothing and household articles. The industrial use of cotton is continually increasing although in tire fabrics it has strong competition from high-tenacity rayon and in bags is exceeded by jute and paper. Jute fabrics are used mainly for wrapping and sacking. Abaca, sisal, henequen (the main material used in binder twine), hemp, and cantala are primarily cordage fibers. Coir and istle are mat and brush fibers. Asbestos is not affected by fire and is therefore used for steam packings and in fire-proof fabrics such as theater curtains.

The following table shows the principal systems used in numbering yarns of various fibers, also how to obtain equivalent counts in the English cotton-yarn number system.

Yarn Numbering Systems and Equivalents

Fixed-weight systems:	Yarn number is number of—	Cotton-yarn equivalents:
Cotton	840-yard hanks per pound	
Worsted	560-yard hanks per pound	Hanks x 2/3
Woolen, run	1600-yard runs per pound	Runs x 1.905
Woolen, cut	300-yard cuts per pound	Cuts x 0.357
Linen (wet-spun)	300-yard leas per pound	Leas x 0.357
Asbestos	100-yard cuts per pound	Cuts x 0.119
Glass	100-yard cuts per pound	Cuts x 0.119
International metric	1000 meters per kilogram	Number x 0.59
French half-metric	1000 meters per ½ kilogram	Number x 1.18
Fixed-length systems:		
Raw silk	Deniers per 450 meters	5315÷deniers
Rayon, nylon, etc.	Deniers per 450 meters	5315÷deniers
Flax (dry-spun)	Lbs. per 14,400-yard "spyndle"	17.14÷lbs.
Hemp and jute	Lbs. per 14,400-yard "spyndle"	17.14÷lbs.

Yarns made from specialty hairs (mohair, camel hair, alpaca,

vicuna, etc.) are numbered the same as yarns (worsted or woolen) made from wool of the sheep.

So-called "staple fiber" (of rayon, nylon, etc.) is numbered on the basis of the deniers per 450 meters. Yarns spun therefrom (i. e. spun rayon, spun nylon, etc.) are numbered the same as cotton yarn if spun on cotton spindles, and the same as worsted yarn if spun on worsted spindles.

Thrown silk yarn is numbered in the United States and in most other countries on the same basis as raw silk, in deniers per 450 meters. Thrown silk was formerly numbered here, and is still usually numbered in England, on the basis of drams per 1,000 yards. To convert denier counts to dram counts divide the deniers by 17.44, a constant obtained by dividing 4,464,528 by 256,000. To obtain the cotton-yarn equivalent of drams per 1,000 yards divide 304.76 by the drams.

Ply yarn is numbered to indicate the count of the single yarn and the number of single yarns which are twisted together. Thus 40/2 cotton yarn means that two ends of single 40s have been twisted together; this 40/2 is approximately equivalent to single 20s. Similarly a cabled yarn listed as 24/8/3, composed of eight ends of single 24s twisted together and then three of these ply yarns twisted together, is approximately equivalent to single 1s. The 20s and the 1s are derived arithmetically; the exact equivalents depend on the contraction in length caused by the twistings and will vary according to the number of turns twist per inch.

The only exception to the above rule for numbering ply yarn is the English system (also used in the United States) for numbering spun silk (made from silk waste) where ply as well as single yarns are based on the number of 840-yard hanks to the pound. For instance, 60/1 cotton or spun-silk yarns measure 50,400 yards per pound; 60/2 cotton yarn consists of two ends of 60s and so measures 25,200 yards per pound but 60/2 spun silk consists of two ends of 120s and therefore measures 50,400 yards per pound. The Continental system for numbering ply yarns of spun silk (schappe) shows the count of the single yarn (in 1,000 meters per kilogram) and the number of these which are twisted together; in this it follows the regular rule and not the variation therefrom used in the English spun-silk numbering system.

Attempts have been made to secure the adoption of a universal system of yarn numbering that would apply throughout the world to yarns of any material. At the Paris Conference of 1900 there was adopted the international metric system of 1,000 meters per kilogram, or meters per gram. This system now predominates in various metric-system countries for yarns of wool, linen, etc. How-

ever, it has not succeeded in displacing the established yarn numbering systems for cotton, raw silk or rayon. Raw silk and rayon are almost universally numbered on the basis of the deniers per 450 meters. For cotton yarn the English numbering in 480-yard hanks per pound is almost universal, being used not only in all English speaking countries but in India, China, Japan, the Soviet Union, Germany, Italy, etc., irrespective of whether metric or other units are in general use. For a long period England dominated the international trade in cotton yarn and when yarn importing countries started yarn manufacturing they naturally continued the yarn numbering system to which they had become accustomed. Even France modified the international metric system of 1,000 meters per kilogram to 1,000 meters per 500 grams to get yarn numbers that would approximate those obtained by the English system, and Spain secured even closer approximation by stating the yarn number in 777½ meter "madejas" (hanks) per 440 grams. (The exact equivalent of 840 yards per pound is 768.096 meters per 453.6 grams.)

To convert to the international metric number (in meters per gram) multiply the cotton yarn number (in 840-yard hanks per pound) by 1.693. To convert deniers per 450 meters to the international metric number divide the constant 9,000 by the deniers.

In addition to the principal yarn-numbering systems shown in the table there are a large number of old established local systems, especially in the United Kingdom, which persist to this day. Even in the United States there is variation in the numbering of woolen yarn, New England using 1,600-yard runs and Philadelphia and vicinity using 300-yard cuts per pound.

Since the Paris Conference various other "universal" yarn count systems have been advocated. These include one (known as "Typp") based on the number of thousand yards per pound, one (known as "Grex") based on the weight in grams of 10,000 meters, and also one based on the weight in drams of 1,000 yards. None of these seems likely to secure world-wide approval. Some advocate a fixed-weight system and others a fixed-length system; some advocate metric units and others prefer English units; and there is wide disagreement as to the particular weights and lengths to be used. Even if representatives from the principal cotton manufacturing countries were to approve some "universal" system the great cost involved in making changes would be deterrent to its practical application.

In the leading textile industries—cotton, rayon, and wool—there is an increasing trend towards the production of mixed goods, so that these industries are yearly becoming more interde-

pendent. This is particularly true of cotton and rayon, for instance the Bureau of the Census has recently had to change its monthly reports on "Cotton Spinning Activity" to "Cotton System Spinning Activity." It showed cotton-system spinning spindles in place December, 1948, as 23,751,000, of which those active were divided into 20,776,000 consuming cotton only, and 1,267,000 consuming materials other than cotton; the latter were mostly consuming rayon staple fiber in the production of spun-rayon yarn.

United States consumption of the principal clothing fibers are shown in the following table compiled by the Rayon Organon for the years 1921-1948.

Textile Fibers: United States Mill Consumption, 1921-1948

(In millions of pounds)

Year	Cotton	Man-made fibers* Rayon	Other	Wool†	Raw silk	Total
1921	2,595.3	19.8		343.4	42.3	3,000.8
1922	2,909.8	24.7		406.5	48.1	3,389.1
1923	3,120.5	32.5		422.4	47.1	3,622.5
1924	2,636.6	42.2		342.2	47.8	3,068.8
1925	3,074.7	58.2		349.9	66.0	3,548.8
1926	3,214.8	60.6		342.7	65.6	3,683.7
1927	3,587.7	100.0		354.1	71.6	4,113.4
1928	3,184.2	100.5		333.2	74.4	3,692.3
1929	3,422.7	133.4		368.1	81.0	4,005.2
1930	2,610.9	118.8		263.2	75.7	3,068.6
1931	2,656.6	158.9		311.0	77.0	3,203.5
1932	2,463.3	155.3		230.1	70.5	2,919.2
1933	3,052.5	217.2		317.1	59.5	3,646.3
1934	2,655.4	196.9		229.7	58.3	3,140.3
1935	2,754.7	259.1		417.5	62.3	3,493.6
1936	3,470.2	322.4		406.1	57.8	4,256.5
1937	3,657.1	304.7		380.8	53.6	4,396.2
1938	2,918.7	329.4		284.5	51.7	3,584.3
1939	3,629.7	458.8		396.5	47.3	4,532.3
1940	3,953.6	482.0	5.0	407.9	35.8	4,884.3
1941	5,187.3	591.8	13.0	648.0	23.4	6,463.5
1942	5,636.7	620.8	26.0	616.2	5.0	6,904.7
1943	5,269.0	656.1	39.0	636.2	1.4	6,601.7
1944	4,792.4	704.8	49.0	622.8	0.6	6,169.6
1945	4,511.3	769.9	52.0	645.1	0.5	5,978.8
1946	4,906.6	875.5	56.0	748.3	6.5	6,592.9
1947	4,763.5	987.9	50.0	708.3	2.0	6,511.7
1948	4,540.5	1,149.4	74.0	704.7	7.4	6,476.0

*Filament and staple. †Clean scoured weight.
Source: The "Rayon Organon," March, 1948.

Not included in the above table are textile fibers of substantial consumption such as jute, abaca, henequen, and sisal, and textile fibers of smaller consumption such as istle, flax, hemp, sunn, and cantala (maguey). The amount of such fibers available for consumption in the United States in 1947 was estimated by the Department of Agriculture to total about 1,200 million pounds.

Raw Cotton

Cotton is the main tertile fiber of the world and in mill consumption it probably equals all other textile fibers combined. Cotton's primacy may be said to be based on the invention of the cotton gin by Elias Whitney in 1793; prior to that time the leading textile fibers were wool, flax, and hemp, with cotton constituting less than 5 per cent of the total textile raw materials.

World production of cotton attained an all-time record in the growth year 1937 with 38,630,000 bales (of 478 pounds net), or about 18,465,000,000 pounds of lint. Of this amount the United States supplied 18,946,000 bales or about 9,056,000,000 pounds. The United States leads in the production of cotton and is followed by India (now India and Pakistan), the Soviet Union, China, Brazil and Egypt. Production in other countries, although increasing, constitutes a relatively small part, usually less than 15 per cent, of the world total.

The world's mill consumption of cotton attained an all-time record in the crop year ending July 31, 1937, with 30,638,000 bales (of 478 pounds net), or about 14,645,000,000 pounds of lint. (It is estimated that the equivalent of some 2 million bales is consumed outside of the mills in making handspun yarn and for wadding or other uses.) Of the total mill consumption stated above the United States accounted for 7,950,000 bales, or about 3,800,000,000 pounds of lint. Mill consumption of cotton in the United States reached its zenith with 11,433,444 bales (of 478 pounds net), or about 5,465,000,000 pounds of lint, in the calendar year 1942. In cotton consumption the United States was followed in 1937 by Japan, the Soviet Union, Great Britain, China, India, France, Germany, Brazil and Italy, and in 1948 by India-and-Pakistan, the Soviet Union, Great Britain and China.

Cotton is classified commercially according to (1) staple length, (2) grade, and (3) character. Staple length is the length of the fibers. Grade refers to color and brightness, the amount of foreign matter, and ginning preparation. Character refers to the diameter, strength, maturity, uniformity, and smoothness of the fibers and to all other qualities not covered by staple length and grade.

There are many varieties of cotton. Those of interest to American mills may be summarized as follows:

Short-staple Uplands. This type constitutes the bulk of American production and consumption; the staple ranges from less than $\frac{7}{8}$ of an inch up to and including $1\frac{3}{32}$ inches. It is used for coarse and medium yarns, rarely for ring-spun yarns much above 40s, but the bulk of the cotton goods of the world are made of yarns within this range. Using the mule, the British spin short-staple Uplands to 50s or slightly above. Texas is the main producer; in the growth year 1948 it was followed by Mississippi, Arkansas, Alabama and Oklahoma.

American Upland cotton (of any length) is graded as follows:

No. 1—Middling Fair
No. 2—Strict Good Middling
No. 3—Good Middling
No. 4—Strict Middling
No. 5—Middling
No. 6—Strict Low Middling
No. 7—Low Middling
No. 8—Strict Good Ordinary
No.9—Good Ordinary

"Middling" is the basic grade of American cotton and $\frac{15}{16}$ inch the basic staple length for transactions in cotton futures.

Long-staple Uplands. American "staple" cotton of $1\frac{1}{8}$ inches and above (mostly $1\frac{1}{8}$ to $1\frac{5}{16}$ inches) constitutes a small proportion, usually less than 5 per cent, of the total Upland cotton produced in the United States. Production of Upland cotton having a staple of $1\frac{3}{8}$ inches or more is negligible. Long-staple as compared with short-staple Upland requires a longer growing season (which makes it more liable to damage from weather and pests) and more labor per acre, it is more difficult to pick and to gin, and gives a much smaller yield per acre; furthermore, it is more difficult to find buyers for off grades. The growing of long-staple Upland is attractive to the planters only when the market prices are sufficiently above those for short-staple Upland to compensate for the greater costs and hazards involved in its production. The Mississippi Delta leads in the production of long-staple Upland cotton and in 1948 was followed by Texas and New Mexico.

American-Egyptians. American-Egyptian cotton is grown by irrigation in Arizona, also to some extent in Texas, New Mexico, and California. After a record crop of 92,000 bales in 1920, pro-

duction declined to an average of less than 20,000 bales in the 1930's; under the stimulus of war-time prices production was almost 74,000 bales in 1942 but thereafter again declined and was only about 1,000 bales in the growth year 1947. Almost all of the American-Egyptian cotton is now (1948) of the SxP variety, produced by cross-breeding the Egyptian Sakellaridis variety and the former American-Egyptian variety known as Pima. SxP cotton is about 1½ inches in length.

Sea Islands. The longest, finest, silkiest, and most costly of all cottons is that known as "Sea Islands." The bulk ranges from 1½ to 1¾ inches in length, but some is as long as 2½ inches. At one time Sea Island cotton was grown in substantial quantities in the United States on islands off the coast of South Carolina and on the littoral of Georgia and Florida. Production was stopped by the boll weevil, and later attempts to revive it failed because with a very low yield per acre the cost of production was higher than the price at which it could be sold. Some is still grown in Puerto Rico but most of the world's small supply of Sea Islands is now obtained from the British West Indies.

Egyptians. The cotton crop of Egypt is confined to long-staple cotton, of which it is the main producer. The Egyptian cotton-growing industry was started about 1820 with Sea Island and Brazilian seed. Cross-breeding, together with special conditions of soil and climate, have resulted in numerous distinctively Egyptian varieties. The brown-tinged Mit Afifi was the most important for a long time; this was succeeded by the longer and whiter Sakellaridis which in turn was displaced by Giza 7 and this by Karnak. Karnak, grown on a commercial scale beginning with 1941, is strong and remarkably uniform in quality, and has the unusual combination of long staple (mostly $1\frac{7}{16}$ to $1\frac{9}{16}$ inches) and high yield. Karnak and other extra-long-staple cottons are produced in the Delta in Lower Egypt between Cairo and the Mediterranean. Ashmouni, an ordinary-long-staple variety, averaging about $1\frac{3}{16}$ inches, predominates in the Egyptian "Uppers" grown in Upper Egypt, the section stretching southward up the Nile River. Extra-long-staple cottons grown in the Anglo-Egyptian Sudan are similar to Egyptians and usually classed therewith.

Peruvians. The two principal cotton varieties grown in Peru are Tanguis and Pima. Tanguis, which constitutes the bulk of the crop, averages about $1\frac{3}{16}$ inches in length and is moderately rough. Some is imported into the United States for special uses, mostly as a binder in spinning asbestos yarn or for mixing with wool. Most of the Peruvian cotton taken by the United States is of the Pima type; this variety was developed from Pima seed im-

ported from the United States in the 1920's and is an extra-long-staple cotton, mostly 1½ to 1⅝ inches, with some up to 1¾ inches.

Indian and Chinese cottons. United States imports of Asiatic cottons are almost entirely of very short harsh varieties of which there is no domestic production. Mostly ½ to ⅝ inch in staple length they are too short to spin but can be made into roving on wool cards. Such roving is twisted around an American-cotton yarn and the combination of roving and yarn used as filling to interweave with American-cotton warp yarn on blanket looms. The warp and core yarns are buried in the body of the fabric so in napping it is the Asiatic cotton roving which is raised. This harsh and resilient cotton produces a nap which is more or less permanently erect, even after repeated launderings. Because of its resiliency and non-matting qualities, short harsh Asiatic cotton is also preferred in making batting and wadding for special uses, such as in shoulder pads, in patchwork quilts, and in milk filters.

Cotton Yarns: Yards Per Pound

Cotton yarns	Yards per pound	Cotton yarns	Yards per pound	Cotton yarns	Yards per pound
1	840	46	38,640	91	76,440
2	1,680	47	39,480	92	77,280
3	2,520	48	40,320	93	78,120
4	3,360	49	41,160	94	78,960
5	4,200	50	42,000	95	79,800
6	5,040	51	42,840	96	80,640
7	5,880	52	43,680	97	81,480
8	6,720	53	44,520	98	82,320
9	7,560	54	45,360	99	83,160
10	8,400	55	46,200	100	84,000
11	9,240	56	47,040	105	88,200
12	10,080	57	47,880	110	92,400
13	10,920	58	48,720	115	96,600
14	11,760	59	49,560	120	100,800
15	12,600	60	50,400	125	105,000
16	13,440	61	51,240	130	109,200
17	14,280	62	52,080	135	113,400
18	15,120	63	52,920	140	117,600
19	15,960	64	53,760	145	121,800
20	16,800	65	54,600	150	126,000
21	17,640	66	55,440	155	130,200
22	18,480	67	56,280	160	134,400
23	19,320	68	57,120	165	138,600
24	20,160	69	57,960	170	142,800

Cotton Yarns: Yards Per Pound (Continued)

Cotton yarns	Yards per pound	Cotton yarns	Yards per pound	Cotton yarns	Yards per pound
25	21,000	70	58,800	175	147,000
26	21,840	71	59,640	180	151,200
27	22,680	72	60,480	185	155,400
28	23,520	73	61,320	190	159,600
29	24,360	74	62,160	195	163,800
30	25,200	75	63,000	200	168,000
31	26,040	76	63,840	205	172,200
32	26,880	77	64,680	210	176,400
33	27,720	78	65,520	215	180,600
34	28,560	79	66,360	220	184,800
35	29,400	80	67,200	225	189,000
36	30,240	81	68,040	230	193,200
37	31,080	82	68,880	235	197,400
38	31,920	83	69,720	240	201,600
39	32,760	84	70,560	245	205,800
40	33,600	85	71,400	250	210,000
41	34,440	86	72,240	260	218,400
42	35,280	87	73,080	270	226,800
43	36,120	88	73,920	280	235,200
44	36,960	89	74,760	290	243,600
45	37,800	90	75,600	300	252,000

Rayon

Rayon, the first man-made fiber to be produced on a commercial scale, is still the most important. Rayon is a generic term for filaments made from various solutions of modified cellulose by pressing or drawing the cellulose solution through an orifice and solidifying it in the form of a filament. Rayon is obtainable as "rayon filament" in long continuous lengths and as "rayon staple" in short spinnable lengths.

Cellulose, the basic material in the manufacture of rayon, is the predominant constituent of the solid framework (cell walls) of plants. There are almost as many types of cellulose as there are of plants and only a limited number have as yet been found suitable for rayon manufacture. The material most largely used is bleached sulphite wood pulp made from needle-leaf, cone-bearing trees, commonly known as soft woods, such as spruce, western hemlock, and southern pine; wood pulp of rayon grades can also be made from hard woods such as beech, birch, and other broadleaf trees. The best material for rayon manufacture consists of purified cotton linters (almost pure cellulose) but these are normally

higher in price than wood pulps. The consumption of refined cellulose by the United States rayon industry in 1948 totaled 539,500 short tons, of which 435,000 tons were wood pulp and 104,500 tons were linter pulp. United States production of rayon (filament and staple) in 1948 totaled 562,000 short tons. It takes more than a pound of chemical pulp to make a pound of viscose rayon (100 per cent regenerated cellulose), but it takes less than a pound of chemical pulp to make a pound of acetate rayon as the latter is a chemical compound of about two-thirds cellulose and one-third acetyl. Rayon producing mills receive their basic material from pulp mills in the form of large sheets resembling blotting paper.

Most rayon is made by the viscose process but there is also a large production of cellulose acetate rayon. The output of cuprammonium rayon is small. The original nitrocellulose process has been discontinued in the United States and in most other countries.

The three current processes for making rayon employ different chemicals and techniques but all are based on the principle of chemically treating high-grade wood pulp or purified cotton linters to form a solution which is forcibly extruded through the microscopic holes of spinnerets and solidified as filaments. Spinnerets may be likened to thimbles with pierced holes. Spinnerets used in the manufacture of textile-type rayon filaments have 15 to 150 or more holes and the filaments from each spinneret are combined with a slight twist, usually 2 to 7 turns per inch, to make the "single" yarn. Such yarn is now usually put up on cones although also obtainable in skein or other form. A relatively small amount of these multifilament singles is subsequently made into high-twist singles or into ply yarns on "throwing" spindles. High-tenacity rayon yarns, such as are used in tires, are produced by stretching or drawing out the filaments during manufacture; this stretch-drawing greatly increases the tensile strength.

In addition to regular multifilament yarn the rayon industry also produces grouped filaments consisting of parallel-wound filaments without twist; such "zero-twist" yarn is used in covering electrical wires, in braiding, in making ribbonzene (non-woven ribbons), novelty twine and string, and V-belts; some is thrown into high-twist crepe yarns. Another type of grouped filaments, known as "rayon tow," is the product of a large number of special spinnerets, each having many more orifices than those used in making textile-type multifilament yarn; the filaments from the battery of spinnerets are not twisted together but are "towed"

away as a heavy rope-like mass of many thousands of parallel filaments.

Artificial horsehair, an accessory product of the rayon industry, is a monofilament used mainly for hat braids and dress trimmings.

Rayon staple, as compared with rayon filament, is of much more recent origin, commercial production commencing in the late 1920's. It consists of spinnable filaments of short staple, usually ranging from 1 to 8 inches, made by cutting or breaking rayon tow. Rayon staple can be processed into rayon yarn on various textile machinery systems; the bulk is processed on regular cotton mill machinery. Using recently devised tow-to-top or tow-to-sliver methods the tow is cut or broken into staple lengths without disturbing the parallel alinement of the fibers; staple so made is prepared directly for spinning without preliminary carding or combing operations. Rayon staple is also made into tops, with or without blending with wool, in worsted mills.

Staple fiber is made from a cellulose solution substantially identical with that prepared for continuous filament rayon. However, as uniformity in filament diameter and consistency is not a factor the cost of manufacture is greatly cheapened by reason of less rigid control requirements in preliminary processes, by the high-speed extrusion of the filaments through larger spinneret nozzles (each having several thousand apertures), and by the collection of the extruded filaments in bulk from a battery of spinnerets rather than from an individual spinneret.

World production of rayon may be divided into two periods, its gradual development up to about 1920, and its remarkably rapid expansion thereafter. Commercial production began in France about 1890 with an output of about 30,000 pounds made by the nitro-cellulose process invented by Count Hilaire de Chardonnet. The cuprammonium process was inaugurated in France shortly thereafter and was followed by the viscose process in England and later by the cellulose acetate process in England. The first successful manufacture of rayon in the United States was begun in 1911 by the English firm of Courtaulds, Ltd., owners of the original viscose patents.

World production of continuous filament rayon first exceeded 100 million pounds in 1923 and first exceeded 1,000 million pounds in 1936; it continued upward to 1941, declined to a low point in 1945, and then rose to an all-time record of 1,570 million pounds in 1948. World production of rayon staple, which was only about 7 million pounds in 1929, first exceeded 100 million pounds in

1935 and first exceeded 1,000 million pounds in 1939; it reached an all-time record of 1,552 million pounds in 1941; after dropping to a low point in 1945 it again started upward but had attained only 880 million pounds by 1948.

In 1941, when the world's rayon production totaled 2,817 million pounds (1,265 filament and 1,552 staple), the principal producers were Germany, United States, Japan, Italy, United Kingdom and France. Rayon staple predominated in the output of the totalitarian countries (Germany, Japan, Italy); in the output of rayon filament the United States ranked first and Germany second. In 1948, when world production was about 2,450 million pounds (1,570 filament and 880 staple), the United States ranked first in both types, accounting for about 55 per cent of the total rayon filament and about 30 per cent of the total rayon staple. Other important producers were the United Kingdom, Italy, France and Germany.

Rayon filament is numbered the same as raw silk, by the weight in deniers (of 5 centigrams or 0.771618 grain) of a standard length of 450 meters (equivalent, on the basis of the European meter taken as 39.370432 inches, to 492.130 yards). Dividing 7,000 (grains per pound) by 0.771618 and multiplying the quotient by 492.130 there is obtained 4,464,528 as the yards per pound of 1 denier rayon filament. This 4,464,528 can be used as a constant which divided by the weight of any rayon yarn in deniers per 450 meters will give the equivalent yards per pound. Dividing 4,464,-528 by 840 there is obtained the constant 5315 and this divided by deniers per 450 meters will give the equivalent cotton yarn number. Deniers per 450 meters is the same as grams per 9,000 meters.

Non-Cellulosic Synthetic Fibers

Non-cellulosic synthetic fibers are increasing in importance and include a continually enlarging list of new fibers, each with distinctive properties. The total United States production of man-made fibers other than rayon yarn and staple was estimated by the "Rayon Organon" (March, 1949) as increasing from about 5 million pounds in 1940 to 74 million pounds in 1948. These non-cellulosic synthetic fibers include: (a) Thermoplastic polymeric fibers, such as nylon and synthetic resin fibers (Vinyon, Saran, Orlon, etc.); (b) protein-base fibers (Azlon) made from casein (the protein of milk), or from vegetable seed proteins found in corn, soybeans and peanuts; (c) fibers from alginic acid derived from seaweeds, and (d) inorganic fibers from glass. With the exception of the glass fibers, all of these are chemical products; nylon is the most important.

Nylon is the generic or family name for a special class of chemical fibers, of which the first was made by Du Pont in 1938. The chief materials used in making nylon are ammonia and chemicals derived from (a) coal and petroleum, or from (b) furfural obtained from corn cobs and oat hulls. The polyamide (superpolymer) obtained from these by a series of chemical reactions is melted and then extruded in continuous filament form through spinneret holes. Although continuous filament nylon predominates there is an increasing output of nylon staple.

Nylon can be made to fill more varied requirements than any other fiber yet produced. It is particularly suitable for uses where high tensile strength, elasticity, resistance to abrasion, or quick-drying properties are important. It has practically displaced silk in the manufacture of women's full-fashioned hosiery, and it is now used in woven and knit fabrics, in webbing, tape, sewing thread, sash cords, window screens, etc.; its range of uses is continually increasing. During World War II the output of nylon was confined to the production of military equipment such as parachutes, glider tow rope, and airplane tires.

Nylon and other man-made continuous filament yarns are numbered the same as raw silk, by the weight in deniers per 450 meters.

Equivalents of Deniers per 450 Meters in Yards per Pound and in Cotton Yarn Numbers

Deniers per 450 meters	Yards per pound	Cotton yarn number	Deniers per 450 meters	Yards per pound	Cotton yarn number
1	4,464,528	5314.9	45	99,212	118.1
2	2,232,264	2657.5	46	97,055	115.5
3	1,488,176	1771.6	47	94,990	113.1
4	1,116,132	1328.7	48	93,011	110.7
5	892,906	1063.0	49	91,113	108.5
6	744,088	885.8	50	89,291	106.3
7	637,790	759.3	55	81,173	96.6
8	558,066	664.4	60	74,409	88.6
9	496,059	590.5	65	68,685	81.8
10	446,453	531.5	70	63,779	75.9
11	405,866	483.2	72.9	61,242	72.9
12	372,044	442.9	75	59,257	70.5
13	343,425	408.8	80	55,807	66.4
14	318,895	379.6	85	52,524	62.5
15	297,635	354.3	90	49,606	59.1
16	279,033	332.2	95	46,995	55.9
17	262,619	312.6	100	44,645	53.1

Deniers per 450 meters	Yards per pound	Cotton yarn number	Deniers per 450 meters	Yards per pound	Cotton yarn number
18	248,029	295.3	110	40,587	48.3
19	234,975	279.7	120	37,204	44.3
20	223,226	265.7	125	35,716	42.5
21	212,597	253.1	130	34,343	40.9
22	202,933	241.6	140	31,889	38.0
23	194,110	231.1	150	29,764	35.4
24	186,022	221.5	160	27,903	33.2
25	178,581	212.6	170	26,262	31.3
26	171,713	204.4	180	24,803	29.5
27	165,353	196.8	190	23,498	28.0
28	159,447	189.8	200	22,323	26.6
29	153,949	183.3	250	17,858	21.3
30	148,818	177.2	300	14,882	17.7
31	144,017	171.4	350	12,756	15.2
32	139,517	166.1	400	11,161	13.3
33	135,289	161.1	450	9,921	11.8
34	131,310	156.3	500	8,929	10.6
35	127,558	151.9	550	8,117	9.7
36	124,015	147.6	600	7,441	8.9
37	120,663	143.6	900	4,961	5.9
38	117,488	139.9	1,000	4,465	5.3
39	114,475	136.3	1,100	4,059	4.8
40	111,613	132.9	1,150	3,882	4.6
41	108,891	129.6	1,650	2,706	3.2
42	106,298	126.5	2,200	2,029	2.4
43	103,826	123.6	5,315	840	1.0
44	101,467	120.8			

Note.—The constant 4,464,528 divided by deniers per 450 meters gives yards per pound. Yards per pound divided by 840 gives the cotton yarn number.

APPENDIX

United States Weights and Measures

Weights (avoirdupois)

16	drams (dr.)	= 1 ounce (oz.)
16	ounces = 256 drams	= 1 pound (lb.)
437½	grains	= 1 ounce
7,000	grains	= 1 pound
2,000	pounds	= 1 short ton
2,240	pounds	= 1 long ton

Linear Measures

12 inches (in.)	= 1 foot (ft.)
3 feet = 36 inches	= 1 yard (yd.)
1,760 yards = 5,280 feet	= 1 mile
6,080.2 feet	= 1 nautical mile

Square Measures

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square yards = 1,296 sq. in.	= 1 square yard (sq. yd.)
4,840 square yards = 43,560 sq. ft.	= 1 acre
640 acres = 3,097,600 sq. yds.	= 1 square mile

(An acre equals a square of 208.71 feet side)

Cubic Measures

1,728 cubic inches	= 1 cubic foot (cu. ft.)
27 cubic feet = 46,656 cu. in.	= 1 cubic yard (cu. yd.)

Liquid Measures

4 gills	= 1 pint (pt.)
2 pints = 8 gills	= 1 quart (qt.)
4 quarts = 8 pints	= 1 gallon (gal.)
31½ gallons = 126 quarts	= 1 barrel (bbl.)

(A gallon contains 231 cubic inches)
(A liquid quart contains 57.75 cubic inches)

Dry Measures

2 pints	= 1 quart (qt.)
8 quarts = 16 pints	= 1 peck (pk.)
4 pecks = 32 quarts	= 1 bushel (bu.)

(A bushel contains 2,150.4 cubic inches)
(A dry quart contains 67.2 cubic inches)

Measures of Time

60 seconds (sec.)	= 1 minute (min.)
60 minutes = 3,600 seconds	= 1 hour (hr.)
24 hours = 1,440 minutes	= 1 day
365 days = 8,760 hours	= 1 year
366 days = 8,784 hours	= 1 leap year

Metric and English Equivalents

1 micron (0.001 millimeter)	= 0.00003937 inch (= 1/25400 inch)
1 millimeter (1,000 microns)	= 0.03937 inch
1 centimeter (10 millimeters)	= 0.3937 inch

1 meter (100 centimeters)	= 39.37 inches (= 1.0936 yards)
1 kilometer (1,000 meters)	= 0.62137 mile (= 1093.6 yards)
1 square centimeter	= 0.155 square inch
1 square meter (10,000 sq. cm.)	= 1.196 square yards (= 1550 sq. in.)
1 hectare (10,000 sq. meters)	= 2.471 acres
1 cubic centimeter	= 0.0610 cubic inch
1 cubic meter (1,000,000 cu. cm.)	= 1.30794 cu. yds. (= 35.314 cu. ft.)
1 liter	= 1.0567 liquid quarts
1 milligram (0.001 gram)	= 0.015432 grain
1 centigram (0.01 gram)	= 0.15432 grain
1 gram	= 15.432 grains (= 0.03527 ounce)
1 kilogram (1,000 grams)	= 2.2046 pounds (= 35.274 ounces)
1 metric ton (1,000 kilograms)	= 2204.6 pounds
1 mil (0.001 inch)	= 25.4 microns (= 0.0254 mm.)
1 inch (1,000 mils)	= 2.540 centimeters (= 25.4 mm.)
1 foot (12 inches)	= 30.480 centimeters
1 yard (3 feet or 36 inches)	= 0.9144 meter (= 91.44 cm.)
1 hank (840 yards) of cotton yarn	= 768.096 meters
1 mile (1,760 yards or 5,280 feet)	= 1.609 kilometers (= 1609 meters)
1 square inch	= 6.452 square centimeters
1 square foot (144 square inches)	= 929.034 square centimeters
1 square yard (9 sq. ft. or 1,296 sq. in.)	=0.8361 sq. meter (=8361 sq. cm.)
1 acre (4,840 square yards)	= 0.4047 hectare (= 4047 sq. meters)
1 square mile (640 acres)	= 259 hectares
1 cubic inch	= 16.387 cubic centimeters
1 cubic foot (1,728 cubic inches)	= 28317 cubic centimeters
1 cubic yard (27 cubic feet)	= 0.76456 cu. meter (=764559 cu. cm.)
1 liquid quart	= 0.9463 liter
1 grain	= 0.0648 gram
1 ounce (437½ grains)	= 28.35 grams
1 pound (16 ounces or 7,000 grains)	= 0.4536 kilogram (= 453.6 grams)
1 short ton (2,000 pounds)	= 0.9072 metric tons (= 907.2 kg.)
1 long ton (2,240 pounds)	= 1.0160 metric tons (= 1016 kg.)

Metric and English Conversions

Textile length-weight conversions

1 kilogram per 100 lin. meters = 10 grams per lin. meter = 49.6 yards per pound.

49.6 divided by kilograms per 100 linear meters = linear yards per pound.

496 divided by grams per linear meter = linear yards per pound.

Kilograms per 100 linear meters divided by 3.1 = ounces per linear yard.

Grams per linear meter divided by 31 = ounces per linear yard.

Textile area-weight conversions

I kilogram per 100 sq. meters = 10 grams per sq. meter = 54.25 sq. yds. per pound.

54.25 divided by kilograms per 100 square meters = square yards per pound.

542.5 divided by grams per square meter = square yards per pound.

Kilograms per 100 square meters times 0.295 = ounces per square yard.

Grams per square meter times 0.0295 = ounces per square yard.

Textile threads-area conversions

Threads per square centimeter (10 mm. side) times 2.54 = threads per square inch.

Threads per square of 6 mm. side times 4.233 = threads per square inch.

Threads per square of 5 mm. side times 5.08 = threads per square inch.

TS1581.C6 1949
Weave room calculations
3 2922 00102 208 3

DUE DATE

ILL #	308321		
DUE	7-21-00		
	JUL 1 0 2000		
	201-6503		Printed In USA

TS 1581
C6
1949

15171